VOL. XXIII. No. 8. AUGUST 1938

MECCANO MAGAZINE



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6d.

MECCANO



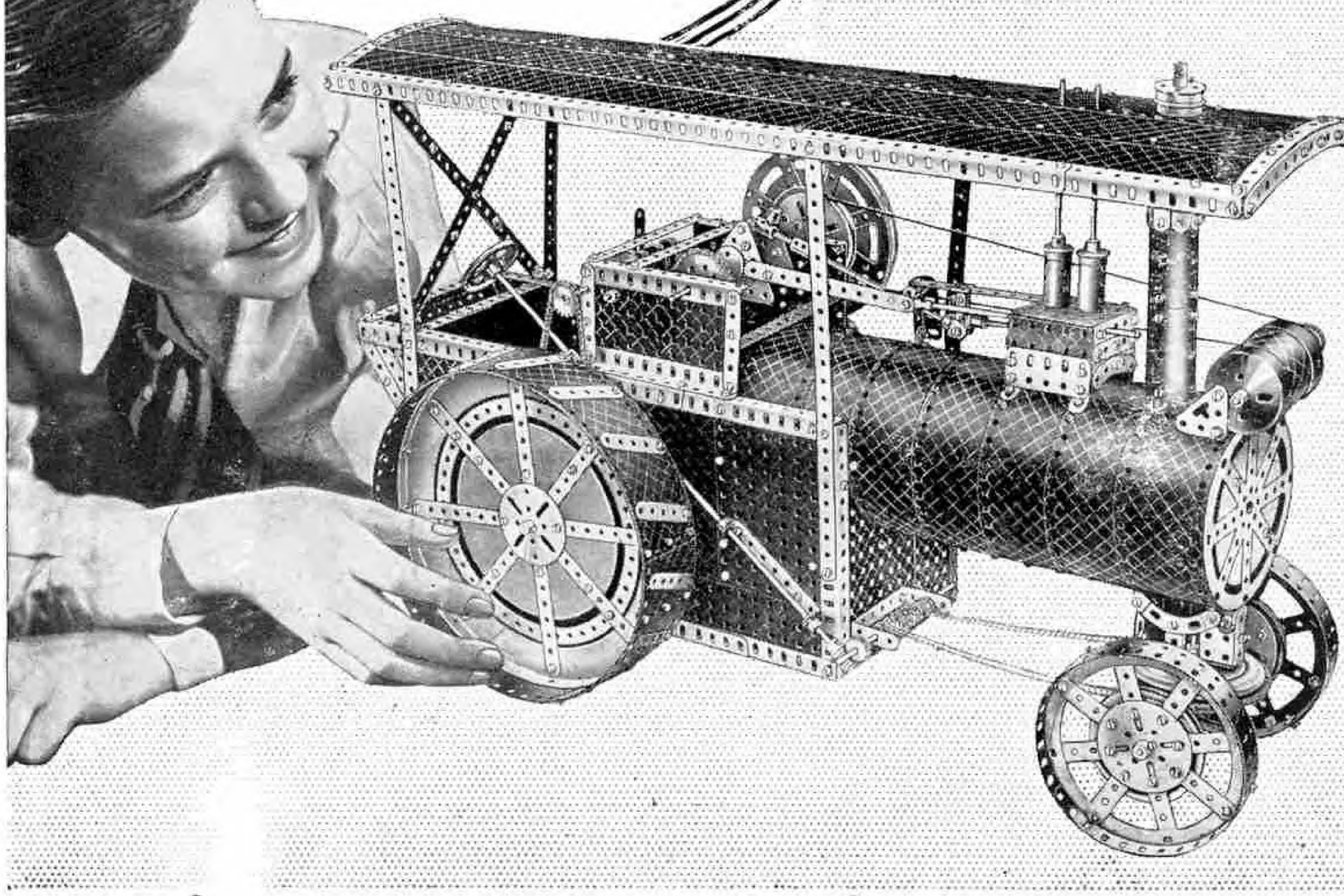
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COMPLETE OUTFITS

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No. 1 „	4	6
No. 2 „	6	0
No. 3 „	9	0
No. 4 „	12	6
No. 5 „	18	0
No. 6 „	24	0
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No. 8 „	66	0
No. 9c „	95	0
No. 9w „	125	0
No. 10 „	255	0

Meccano Outfits from No. 8 upwards can be purchased also through the New Meccano Deferred Payments Scheme. Ask your dealer for full particulars. (Scheme not available outside Great Britain and Northern Ireland.)

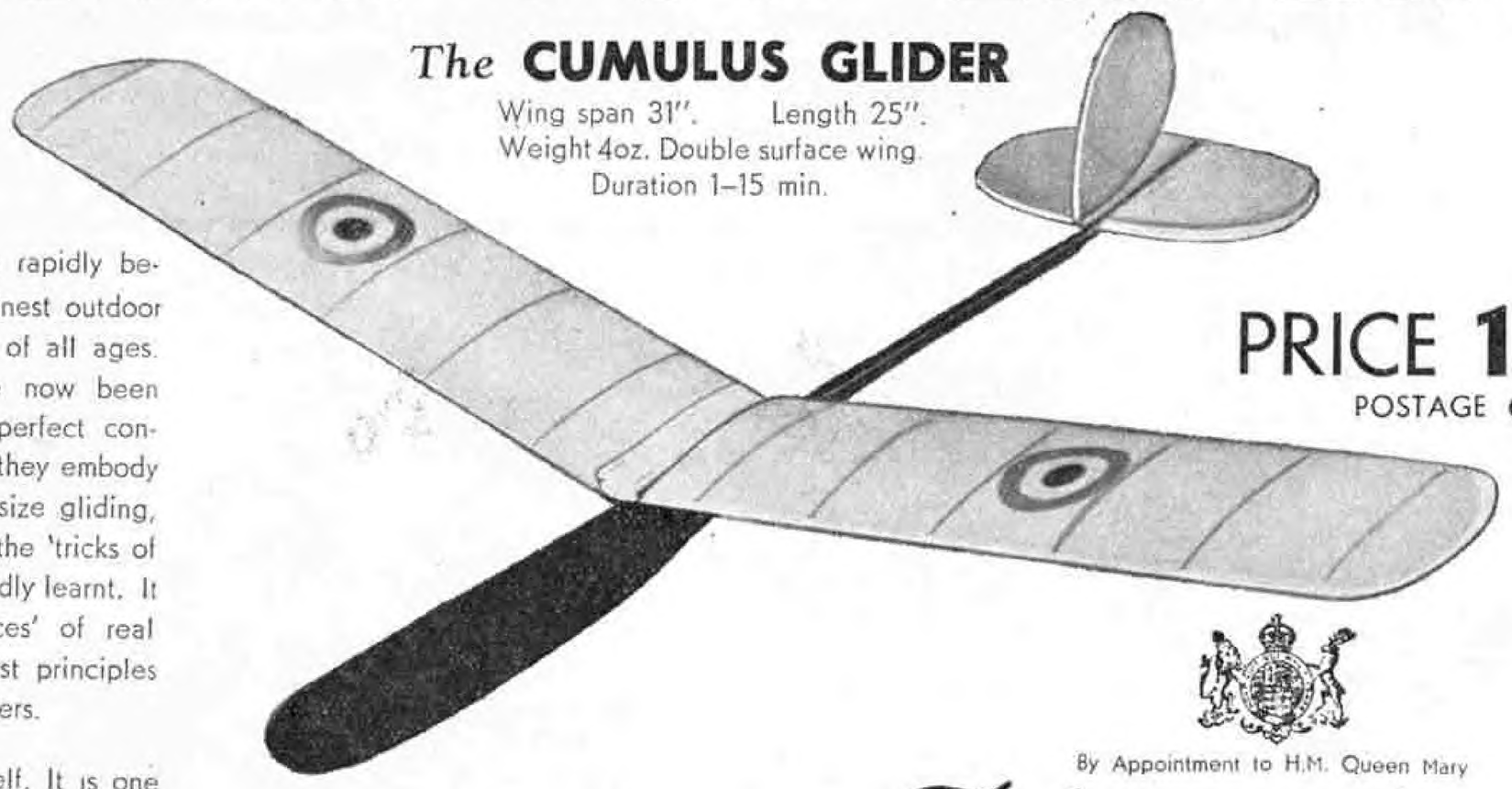


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The **CUMULUS GLIDER**

Wing span 31". Length 25".
Weight 4oz. Double surface wing.
Duration 1–15 min.



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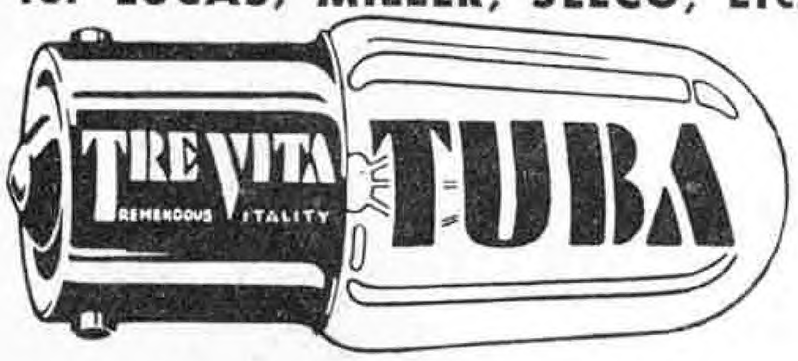
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An efficient light at walking speed, when with the usual Bulb there is no light.

A broad and better light illuminating the whole road—both immediately in front, sides, far ahead, and without any dark patches.

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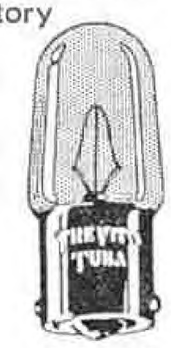
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LSF—Silk Frosted **1'-.** LSC—Clear **11d.**

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OVER 300 VARIETIES

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Every boy or girl who has not already done so should start this delightful collecting hobby to-day. All the models can be purchased either separately or in complete sets.

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Dinky Toys No. 23m
A fine scale model of the car in which Capt. G. E. T. Eyston set up a world land speed record of 312 m.p.h. at Bonneville, Utah, U.S.A., in 1937. Price **1/-** each

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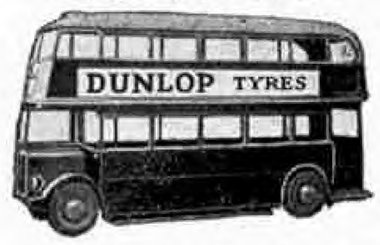
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An interesting model of a modern three-ton wagon. In assorted colours.
Price **1/-** each

TAXI WITH DRIVER



Dinky Toys No. 36g
Fitted with detachable rubber tyres.
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DOUBLE DECKER BUS



Dinky Toys No. 29c
Assorted colours. Fitted with detachable rubber tyres.
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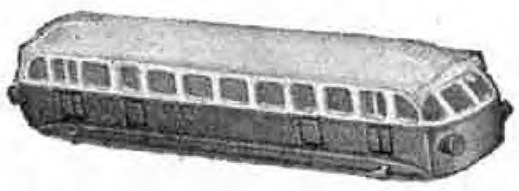
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Scale model of the Airspeed "Envoy" twin engined commercial monoplane. Assorted colours. Price **6d.** each

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Scale model of the Airspeed "Envoy" supplied to the Air Council for the King's Flight.
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Dinky Toys No. 26z
A realistic model of a modern Diesel-engined rail car. Price **5d.** each.
(Made in the Meccano Factory in Paris.)

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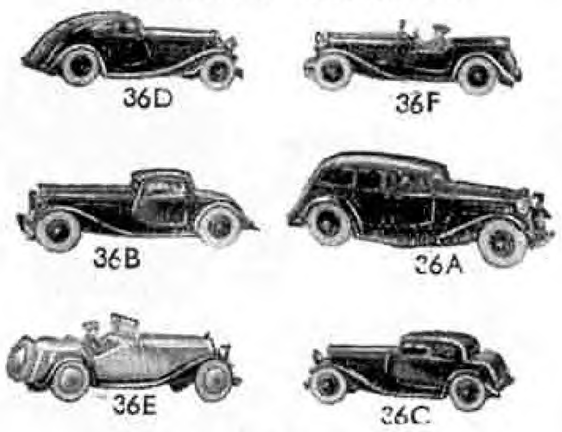
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Scale model of the "Whitley" long-range heavy bomber adopted by the R.A.F.
Price **9d.** each

FLYING BOAT "CLIPPER III"



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Scale model of the Pan American Airways flying boat that took part in the transatlantic experimental flights in 1937.
Price **1/-** each

MOTOR CARS
WITH DRIVERS, PASSENGERS, Etc

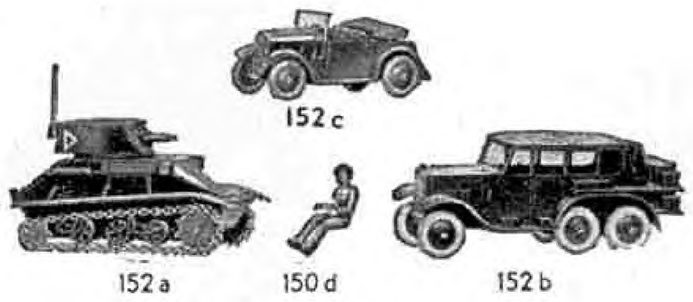


Dinky Toys No. 36
Fitted with detachable rubber tyres. Silver-plated radiators.

No. 36a	Armstrong Siddeley (Limousine) with driver and footman ...	each	**11d.**
No. 36b	Bentley (Two-seater Sports Coupe) with driver and passenger ...	„	**11d.**
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Price of complete set **5/6**

ROYAL TANK CORPS LIGHT TANK SET



Dinky Toys No. 152

No. 152a	Light Tank (4½ tons, 25 h.p.) ...	... each	**1/2**
No. 152b	Reconnaissance Car	... „	**1/-**
No. 152c	Austin Seven Car	... „	**4d.**
No. 150d	Driver	... „	**3d.**

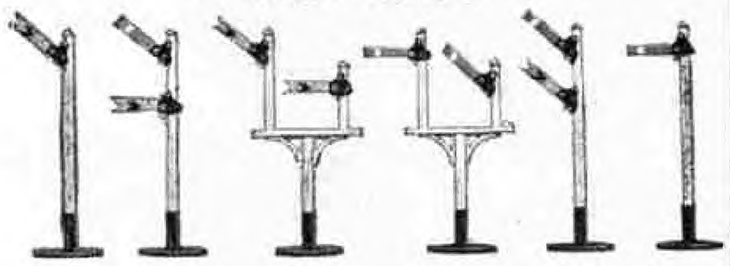
Price of complete set **2/9**

SMALL CARS



Dinky Toys No. 35
No. 35a Saloon Car each **3d.**
No. 35c "M.G." Sports Car ... ... „ **3d.**
Fitted with rubber tyres.
No. 35b Racer each **3d.**
Price of complete set **9d.**

RAILWAY SIGNALS

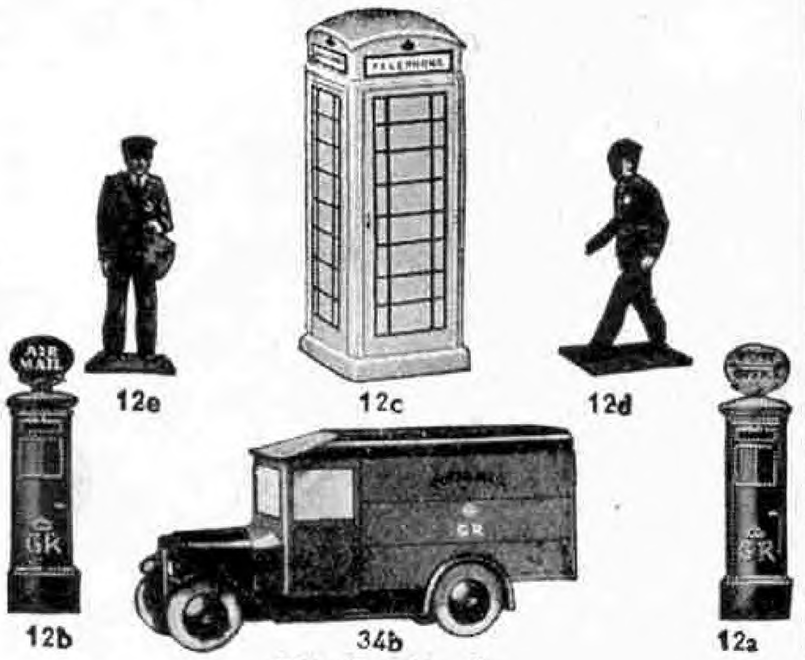


Dinky Toys No. 15

No. 15a	Single Arm Signals ("Home" and "Distant") each	**2d.**
No. 15b	Double Arm Signals (two in set) ... ... „	**3d.**
No. 15c	Junction Signals ("Home" and "Distant") ... „	**4d.**

Price of complete set **1/6**

POSTAL SET

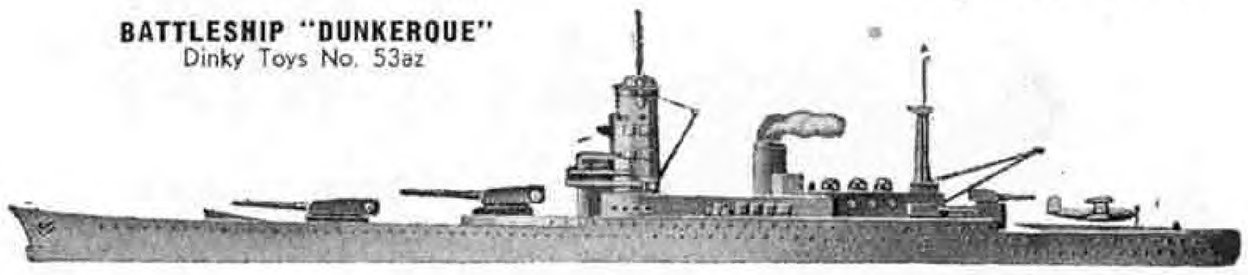


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No. 12b	„ „ Air Mail	„	**3d.**
No. 12c	Telephone Call Box	„	**4d.**
No. 12d	Telegraph Messenger	„	**3d.**
No. 12e	Postman	„	**3d.**
No. 34b	Royal Mail Van	„	**10d.**

Price of complete set **2/3**

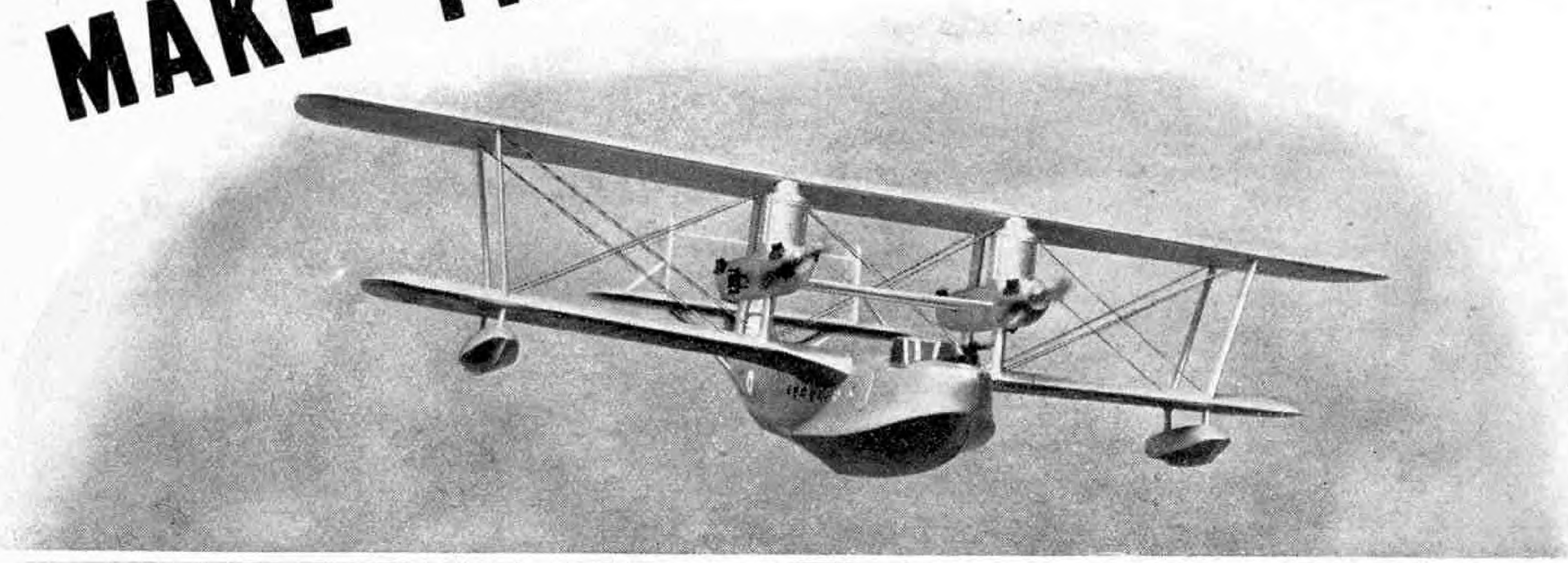
BATTLESHIP "DUNKERQUE"
Dinky Toys No. 53az

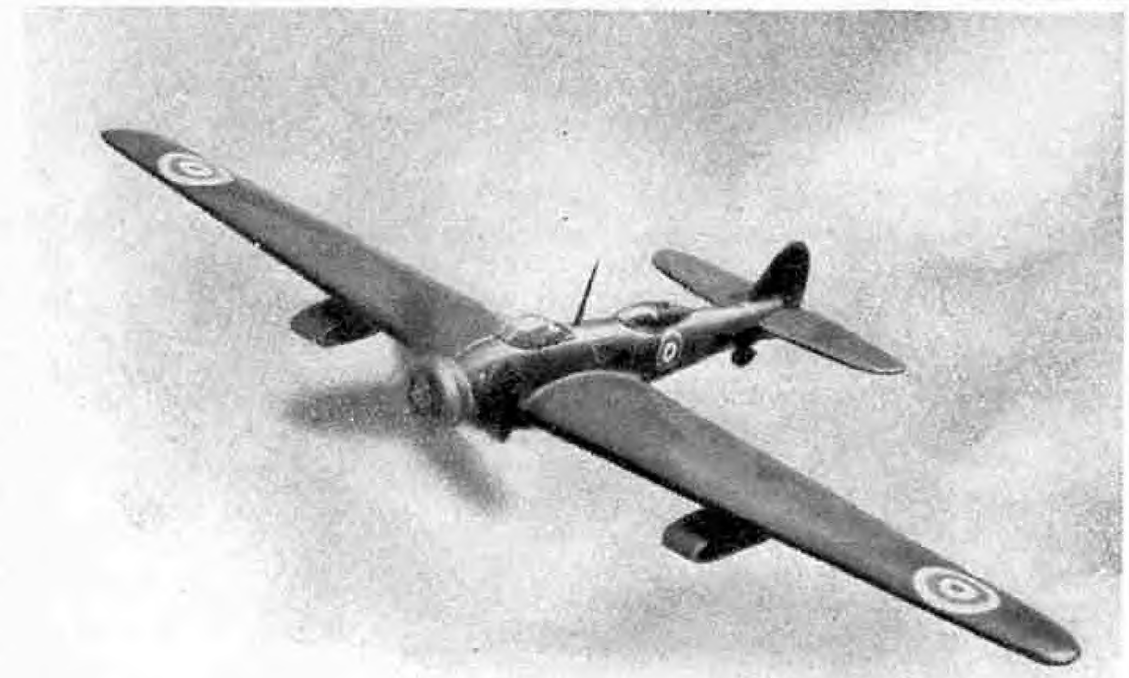


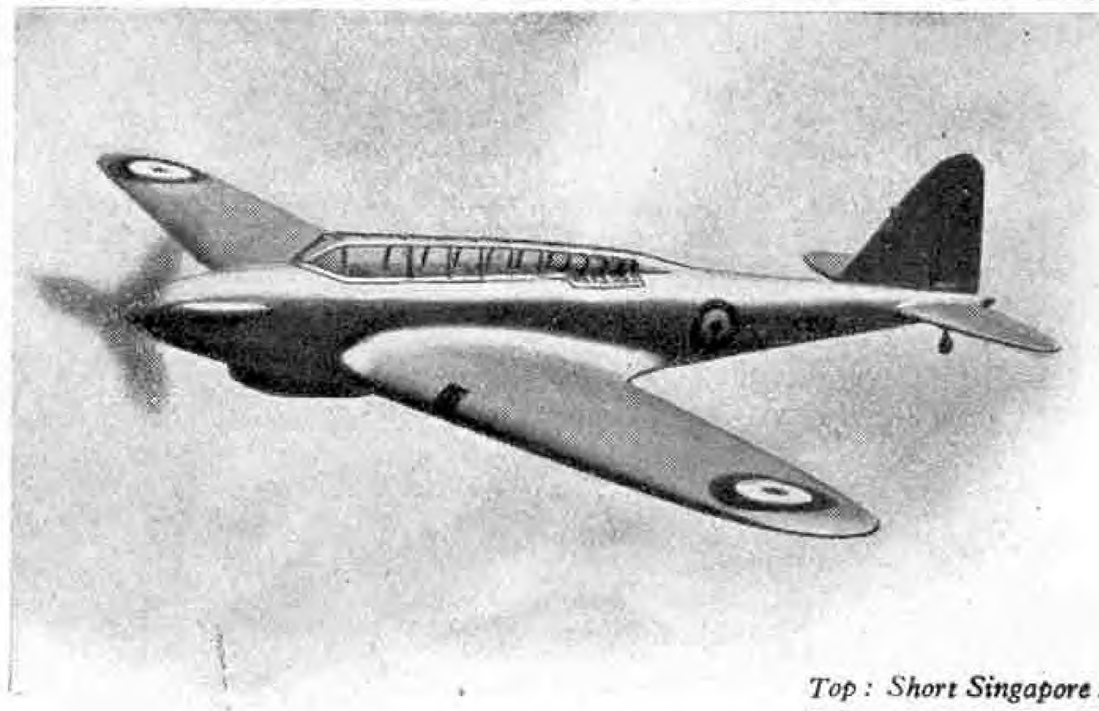
Scale model of the French 26,500 ton Battleship "*Dunkerque*," which has an overall length of 702 ft. 9 in., and a main armament of eight 13 in. guns. Price **9d.** each
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Top : Short Singapore III
Left : Vickers Wellesley
Right : Fairey Battle

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TO EXPERTS Many fascinating new models have been added to the Penguin range including the Fairey Battle, Vickers Wellesley and the Imperial Airways Flying Boat. Keep up-to-date by obtaining these interesting new kits.

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Penguin construction kits from 3s. to 17s. 6d. are obtainable at all good toyshops and stores.

FROG **PENGUIN**
NON-FLYING SCALE-MODELS

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COUPON
Please send me your "Frog" coloured leaflet with particulars of the "Frog" Flying Club and how to obtain handsome enamelled "Frog" Pilot badges.

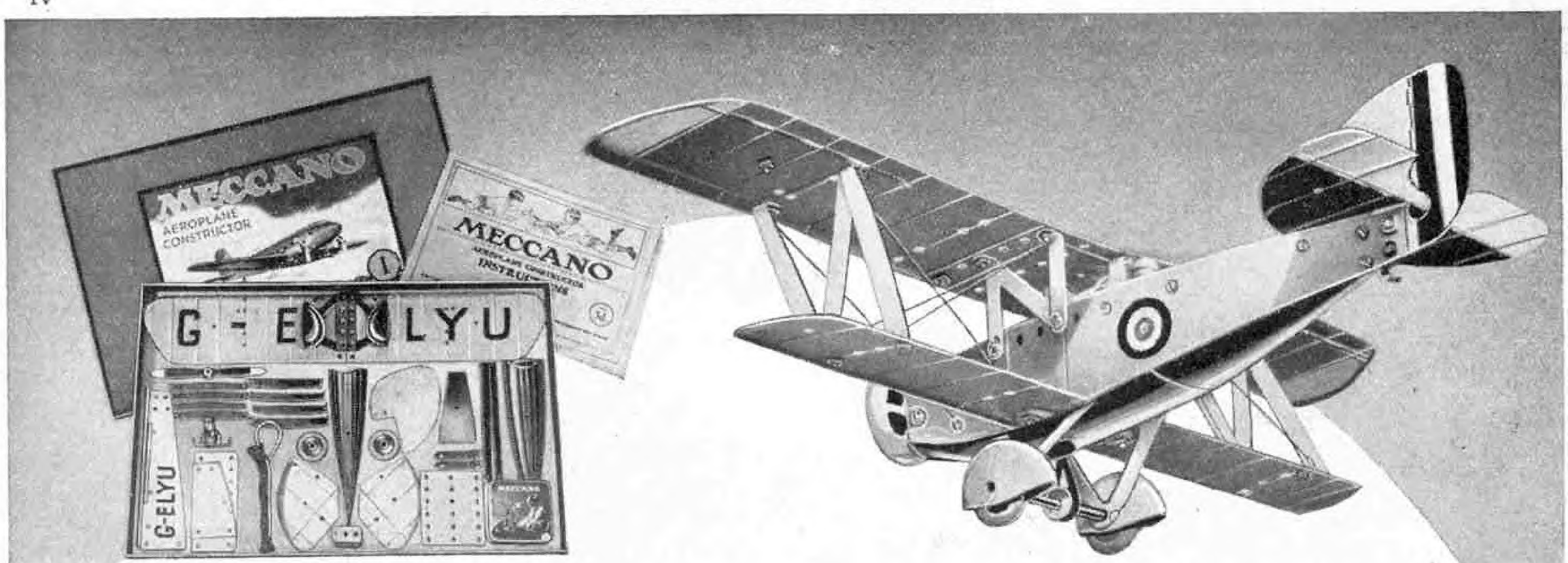
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8/38



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Price List of Aeroplane Outfits

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No. O Outfit	4/6	No. 2 Outfit	13/6

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No. 1 Special Outfit ...	13/6	No. 2 Special Outfit ...	22/6

Note. The parts in the No. OO and No. O Outfits are not intended for use with the larger Outfits.

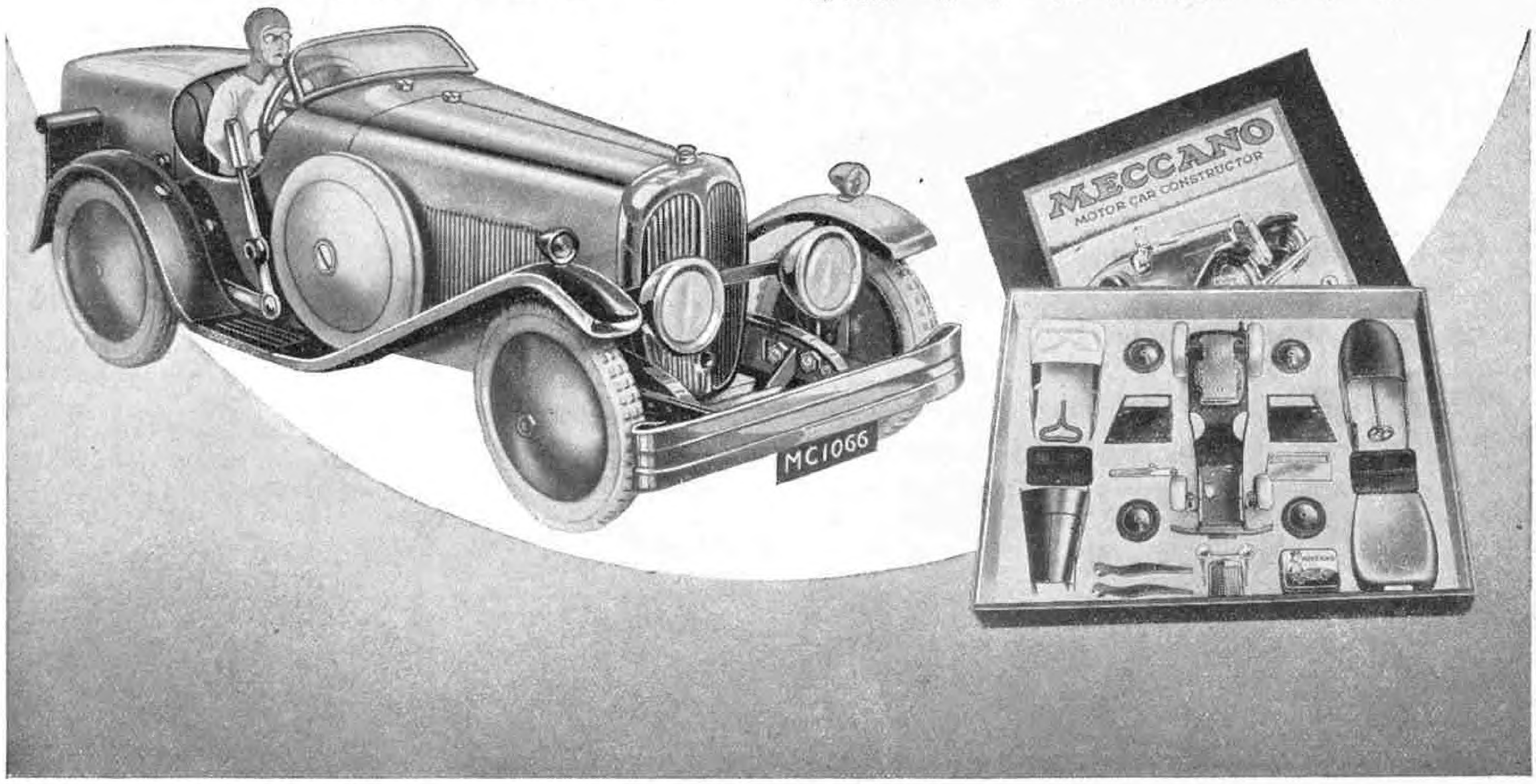
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MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

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MILBRO *TRUE-TO-SCALE models for reliability*

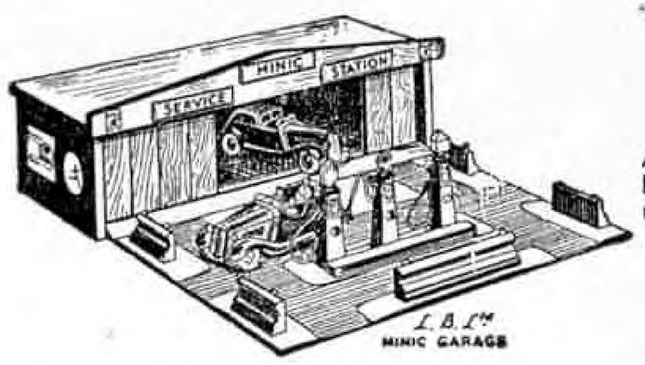
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Realistic new design, fitted with sliding doors and electric light. Equipment includes three large petrol pumps and one large oil cabinet. Light oak finish with folding base.
LENGTH 12 ins. Price **4/11**
CARS NOT INCLUDED.



MINIC £100 Saloon
LENGTH 3⅜ ins.
Price **6d.**



MINIC Tip Lorry
Price **1/3**
LENGTH 5½ ins.



LENGTH 5½ ins.
With Electric Light and Battery **3/6**
Without Electric Light **2/6**



MINIC Traffic Control Car
LENGTH 5 ins. Price **1/6**



MINIC Breakdown Lorry
with Mechanical Crane.
LENGTH 5½ ins. Price **3/6**



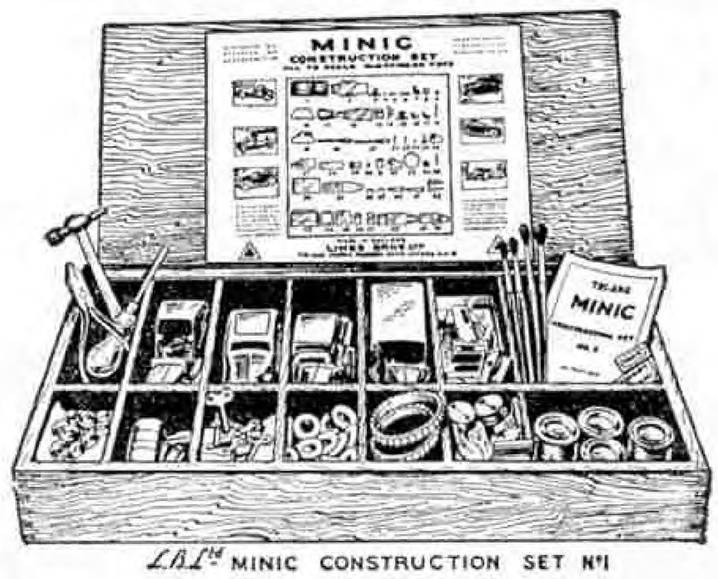
MINIC Searchlight Lorry
with Electric Searchlight and Battery.
LENGTH 5½ ins. Price **3/6**



L.B.Ltd
Nº 3 SERVICE STATION

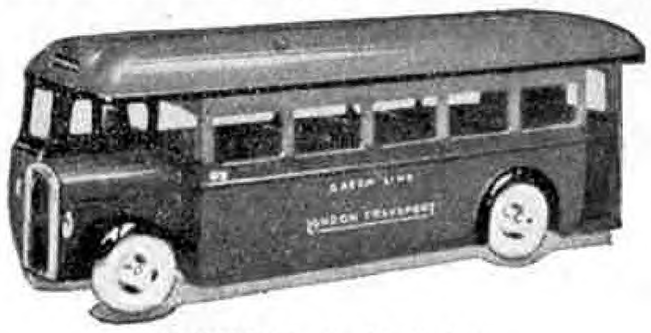
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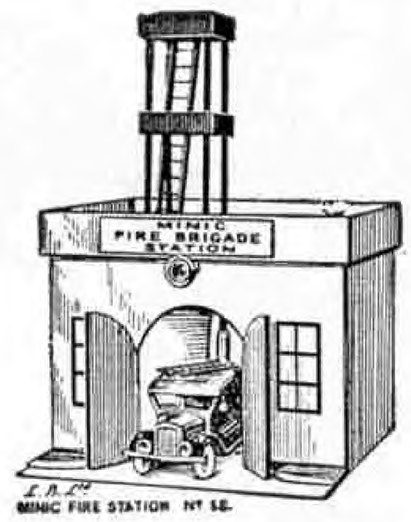
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LENGTH 7 ins. Price **2/-**



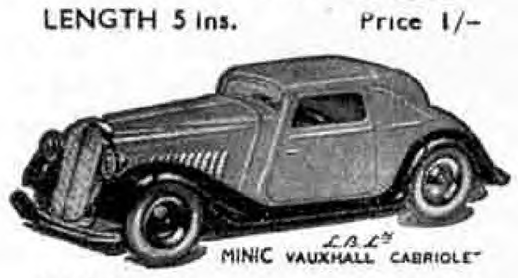
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Can also be obtained without warning signal, etc. Price **5/11**
FIRE ENGINE NOT INCLUDED IN EITHER MODEL.



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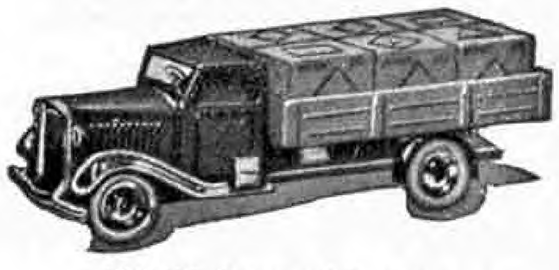
LENGTH 5 ins. Price **1/-**



LENGTH 5 ins. Price **1/-**



MINIC Daimler Sunshine Saloon
with Electric Headlamps and Battery.
LENGTH 5½ ins. Price **3/6**
Without Electric Lights **2/6**



MINIC Lorry with cases
LENGTH 5½ ins. Price **1/6**



MINIC Fire Engine
with Electric Headlamps and Battery.
LENGTH 6½ ins. Price **5/-**

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MECCANO MAGAZINE

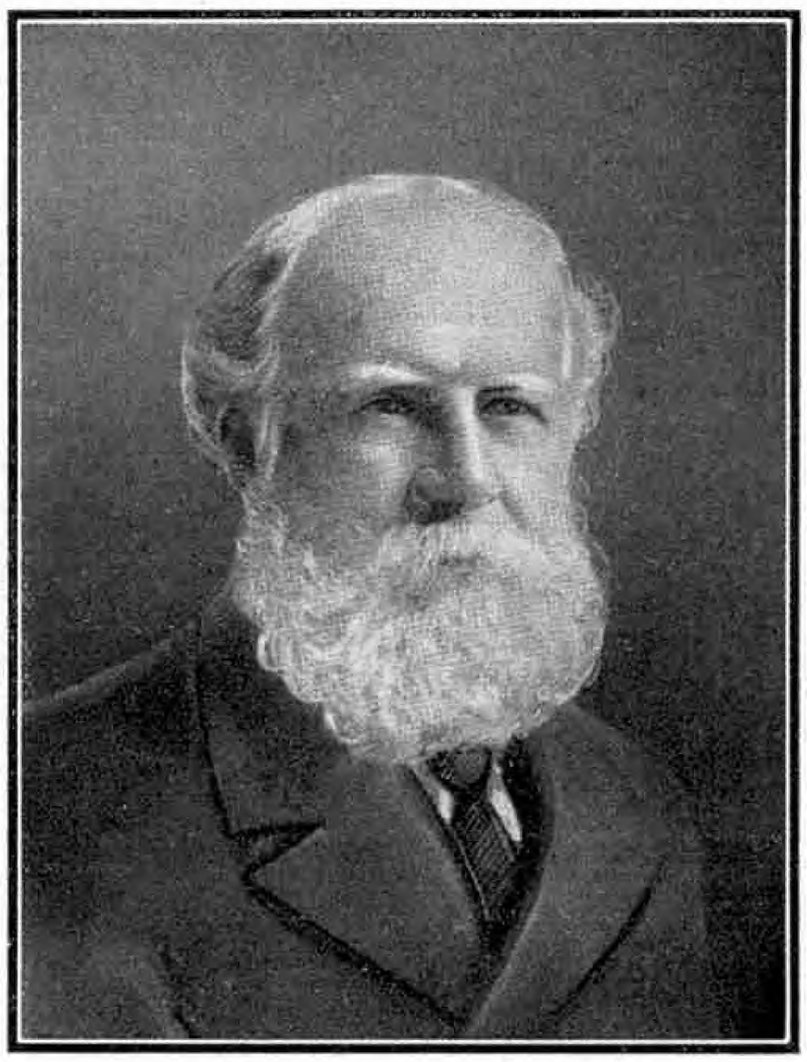
Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXIII. No. 8
August 1938

With the Editor

A Notable Month of Speed

The past month has been notable for speed records. First of all there came the splendid run of the L.N.E.R. "*Coronation*" streamlined express train, during which a speed of 125 m.p.h. was reached. This is the highest speed yet attained by a British steam locomotive, and it provides another demonstration of the efficiency of Sir Nigel Gresley's streamlined "Pacifics." It is notable that the 125 m.p.h. was not merely a momentary speed, but was maintained for over 300 yards; the average over a distance of 5 miles was 120.4 m.p.h. For two miles, partly level and partly downhill, speed was between 123 and 125 m.p.h. It is interesting to note that the locomotive, No. 4468 "*Mallard*," is one of the three streamlined "Pacifics" that have been provided with Kylchap exhaust arrangements including double blast-pipes and chimneys. All accounts speak of the remarkably smooth running of the train at its highest speed.



Lord Avebury (1834-1913), banker and scientist, to whom we owe our Bank Holidays, introduced in 1871.

Round the World in less than Four Days

Even more remarkable events took place in the air, the most striking being the 14,874-mile flight round the world by the American Howard Hughes and his four companions in 3 days 19 hrs. 17 min. This was less than half the time taken by the late Wiley Post, who made a similar world flight solo in 1935, covering 15,420 miles in 7 days 18 hrs. 48 min. The machine used by Hughes was a twin-engined 14-seater Lockheed monoplane, and it is of particular interest to note that it is similar in general construction and in engines to the 200 Lockheed aircraft that have been ordered for the Royal Air Force.

The airmen took off from the Floyd Bennett Airport, New York, on 11th July, and covered the 3,641 miles to Paris non-stop in the record time of 16 hrs. 31 min., averaging 221.24 m.p.h. This was the first non-stop flight from New York to Paris since Col. Lindbergh's famous solo flight in 1927. Hughes and his companions set off again at 1.24 a.m. next morning for Moscow, 1,600 miles away, and from there flew the 1,500 miles to Omsk, in Western Siberia, where they arrived at 7 p.m. After a halt of 4½ hrs. they were in the air again on their way to Yakutsk, also in Siberia, and 2,177 miles distant. The next lap was from Yakutsk to Fairbanks, in Alaska, 2,456 miles; this flight took them over forest and mountain territory, and across the narrow Behring Straits that separate Asia and America. When they landed at Fairbanks at 1.20 a.m. on 14th July they had covered about 11,000 miles and were nearly three days ahead of Wiley Post's time.

After a pause of only 1 hr. 80 min. Hughes and his companions were off again. Flying at 14,000 ft. and using oxygen, they passed safely over the McKenzie mountain range in the extreme north-west of Canada. Their radio transmitter went out of action for six hours after they left Fairbanks, and there was great anxiety in the United States when they did not arrive at Winnipeg as they had intended; but they came down safely at Minneapolis, 400 miles beyond Winnipeg, at 2.38 p.m. A pause of 33 min. was made while the aeroplane was refuelled, and then the fliers set off on the last 1,000 miles to New York, where they landed at the Floyd Bennett Airport at 7.37 p.m., in the presence of a wildly excited crowd of about 40,000 people who gave them a great welcome. This remarkable flight was accomplished at an average speed of 163 m.p.h., including the six stops. The actual flying time was 71 hrs. 41 min., and on this basis the average speed was 214 m.p.h.

Royal Air Force Achievements

Eleven Hawker "Hurricanes" of No. 111 (Fighter) Squadron of the R.A.F. flew from Northolt Aerodrome to Le Bourget Airport on 8th July to take part in the French Air Display at Villacoublay. In spite of unfavourable winds the "Hurricanes" made the flight in 66 minutes, and the return flight in 55 minutes.

Another fine flight was made by four Vickers "Wellesley" aircraft of the Long Range Development Unit of the R.A.F., which completed a non-stop flight of 4,300 miles from Cranwell, Lincs., to Ismailia, Egypt.

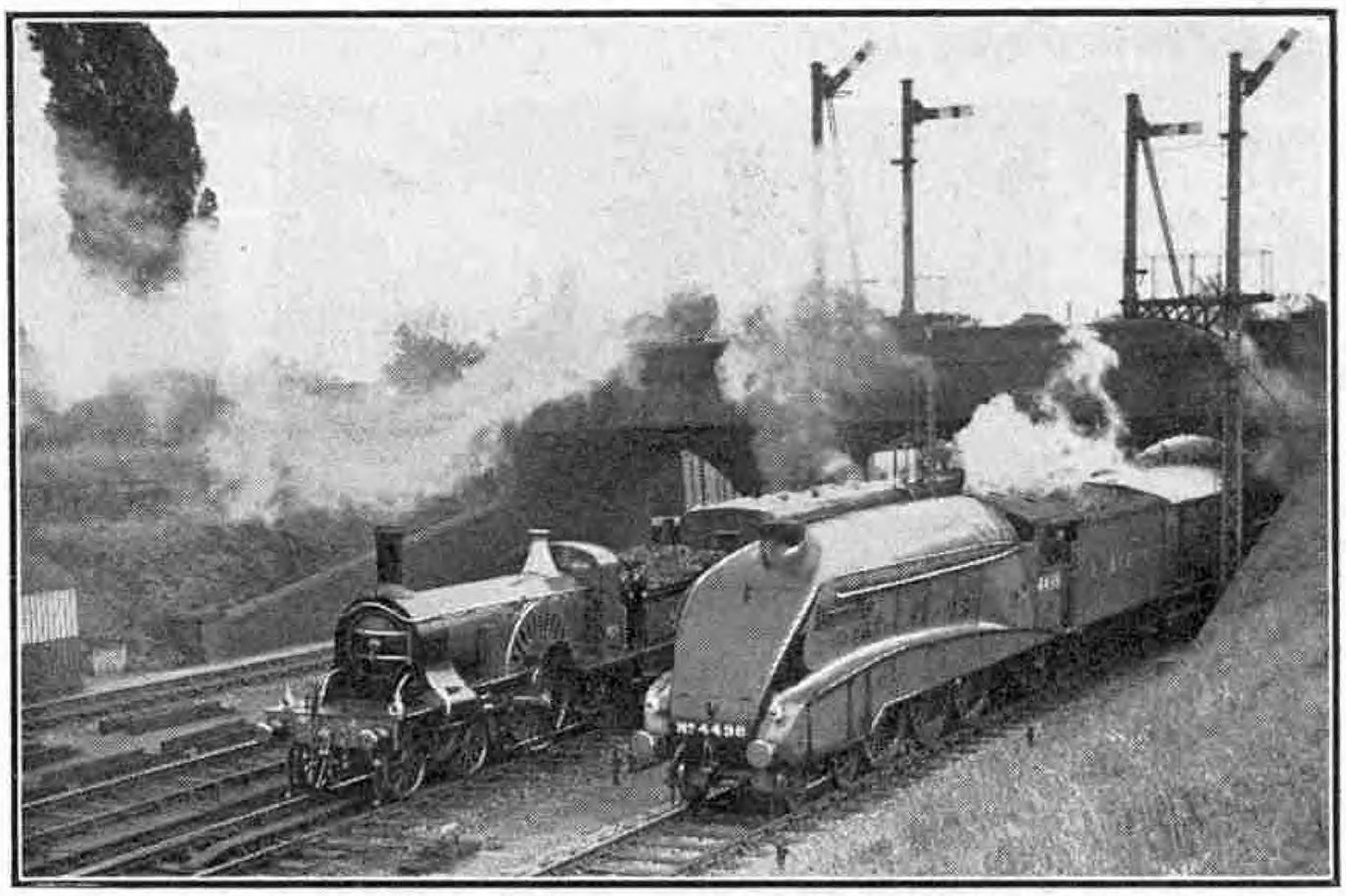
"Flying Scotsman"—Old and New

The Racer of 1888 Runs Again

By a Railway Engineer

IT would, in the ordinary way, require a pretty vivid flight of the imagination to picture what main line travelling was like 50 years ago. Railway progress even in the most enterprising times is a gradual process, and although each new development is greeted with the praise it deserves, it is not easy to state exactly just how far we have advanced in any given epoch. It is for this reason, apart from any others, that the demonstration run of the new "Flying Scotsman" train on 30th June 1938 stands out as one of the most remarkable events ever staged on a British railway. Those of us who were the privileged guests of the L.N.E.R. that afternoon not only enjoyed a spin in the new train hauled by one of the streamlined Pacifics at the very top of its form; we were treated also to the unique experience of travelling at express speed in a replica of "The Flying Scotsman" of 1888.

No wonder the lunch-hour crowds gathered at King's Cross! For here was a pageant of railway history impressive beyond description, the kind of "brain-wave" that not once in a thousand times is capable of being carried through. In No. 8 platform was a trim little train of seven 6-wheeled coaches—just the same load as was taken in the Race to Edinburgh in 1888—and many of the onlookers must surely have rubbed their eyes when that glorious old veteran G.N.R. No. 1, the pioneer Stirling 8-footer, came backing down. What a spectacle she made! The huge single wheel, the elegant motion of the connecting rod accentuated by the uncommon length of the piston stroke, 28 in., and her ornate finish, drew exclamations from the crowd. When writing of her as an exhibit in York Railway Museum, in the *"M.M."* for July 1936, I little thought ever to see her in steam again, much less to travel behind her at nearly 60 m.p.h.



A unique scene at Stevenage, "The Flying Scotsman" of 1888, headed by G.N.R. No. 1, a Stirling single-wheeler, alongside the latest train with the streamlined engine "Sir Nigel Gresley."

When this brilliantly conceived project was finally decided upon, old No. 1 was taken from the York Museum to Doncaster works for overhaul; but she was found to be in such excellent condition that little tuning up was necessary. In view of the present great demand for non-ferrous metals, opportunity was however taken to replace the original copper fire-box and copper tubes by new steel ones. That was the only semblance of rebuilding carried out in order to fit her for the prominent part she was to play in the day's proceedings. But the queer thing was that she seemed in perfect harmony with the old station. Her spotless green paint was matched both in colour and cleanliness by that of the Ivatt "Atlantic" that brought in the 1.42 p.m. Cambridge Buffet Car Express, though the tender of old No. 1 boasted the rich dark green surround that was abandoned when the Great Northern Railway became merged in the L.N.E.R.

Scarcely less fascinating was the coaching stock of 1888, for here, far more so than in the case of the locomotive, could be seen a direct line of descent to the present time. Here were coach bodies in the same varnished teak that is so familiar and so distinctive a feature of L.N.E.R. carriages of to-day. But although these little six-wheelers of 1888 were of Great Northern design, and of Great Northern building, they were owned jointly by the three East Coast partners, and bore the initials E.C.J.S.—East Coast Joint Stock. On the replica train the beautifully executed coach-work of the period was displayed by the four initials woven into an elaborate monogram of scroll letters, and the special crest. In two details the colour-scheme differed from that of to-day. The buffers and draw-gear of the 1888 train were painted olive green with touches of gold, apparently to give an impression of shine; this looked most effective. Then, instead of the white roofs of to-day (a special heat-resisting paint), the carriages of 1888 had roofs painted a pale Cobalt Blue and this belt of colour stopped short a foot or so from the eaves. The old communication cord, which was carried along the outside of the carriages, provided much amusement, and several of the invited guests photographed each other stretching far out of the windows in the attitude necessary to reach and pull the cord.

Some of the highest officials travelled in the train of 1888, including Sir Ralph Wedgwood, Chief General Manager, and Sir Nigel Gresley, Chief Mechanical Engineer, who of course designed the new "Flying Scotsman" train. On the platform before starting there was but one question: "Would No. 1 reproduce her old form?" We were booked to pass Hatfield in 28 minutes, three minutes slower than the normal East Coast timing of to-day, and although one prospective passenger was overheard to remark "I hope the boiler doesn't burst," the crew seemed quietly confident. Driver Austwick and Fireman Fox, of Doncaster, were in charge, and with them on the footplate rode Locomotive Inspector Wigglesworth.

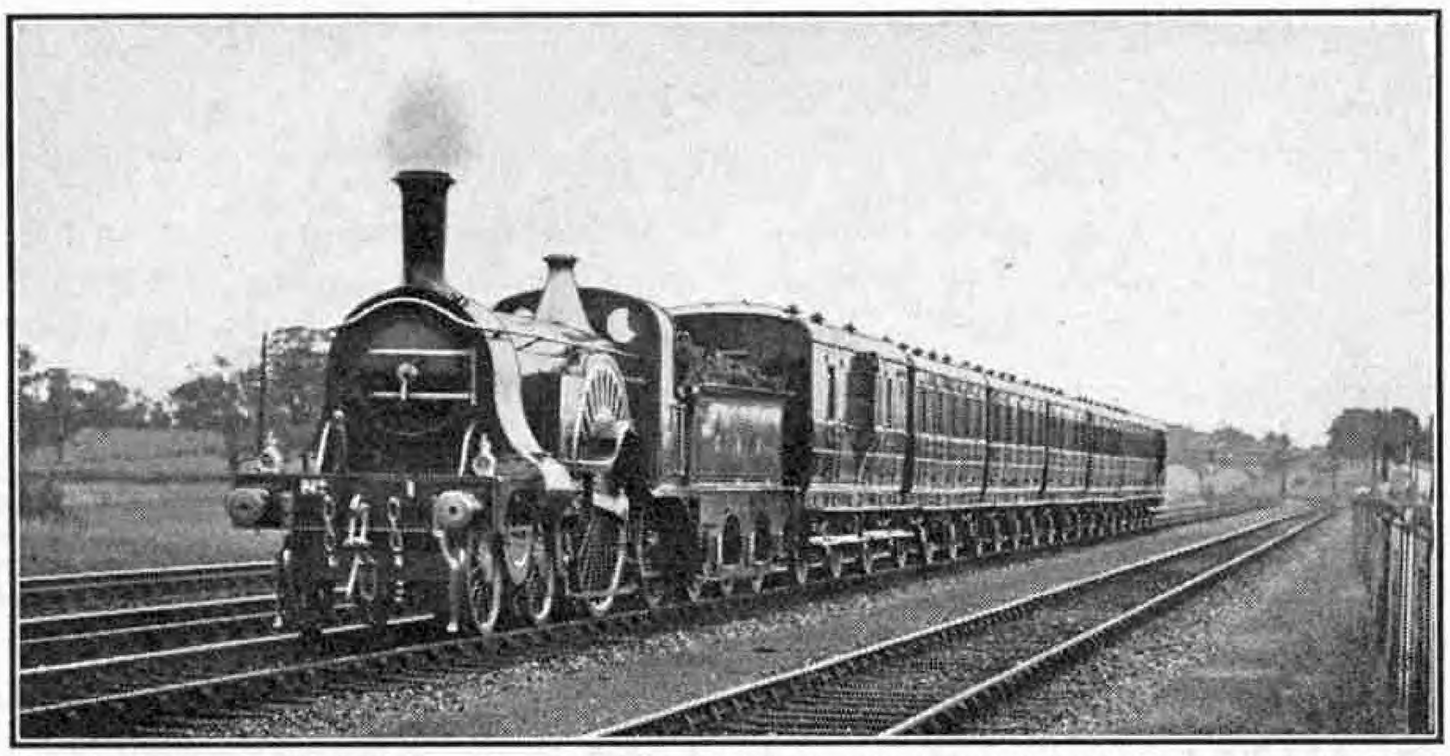
The Editor of the *"M.M."* and I entrained in one of the old first-class carriages, and then sharp at 2 p.m. came the "right-away." Old No. 1 promptly started off as cleanly as any Pacific; without any slipping or fuss we went steadily through the tunnels and up the Holloway bank, and were through Finsbury Park, 2.6 miles, in 6¼ minutes. So far our speed was just about equal to the best East Coast running of to-day—excepting of course the streamlined trains—but once through Harringay the 8-footer began to forge ahead.

We touched 57½ m.p.h. at Wood Green, and in the first stages of the 7¾ mile climb to Potters Bar, continuously at 1 in 200, speed began to fall off in keeping with normal running practice. But when we entered Oakleigh Park tunnel I noted, not without a little thrill, that speed was quite steady, and we came out accelerating smartly on the continuous rising gradient. No. 1 was showing her paces indeed! Up the final stages of the climb we were doing 49-49½ m.p.h. all the way, a speed that I have only once before equalled with an ordinary express train on this bank. So we passed Potters Bar, 12¾ miles out, in 18½ minutes, and with so high a speed over the summit we could quite easily have got through Hatfield in 23½ minutes—4½ minutes early! But we were close on the heels of the 1.43 p.m. semi-fast train, and to hurry any more would have involved us in signal delays.

So, after attaining 56 m.p.h. through Brookman's Park, steam was shut off, and we rolled gently downhill at 45 or 50. Nevertheless we were through Hatfield in exactly 25 minutes (the present schedule of the 1.20 p.m. "Scotsman"); but still more drastic easing followed, and 12¼ minutes were spent over the 8.3 miles from Hatfield to Knebworth. In spite of this however we caught up the 1.43 p.m. and were slowed considerably by signals at Langley Junction.

No. 1 was now practically at her journey's end, and in just 43

minutes from King's Cross we drew up in Knebworth station alongside the new 14-coach "Flying Scotsman." It was an enthralling ride, and the old six-wheeled coaches travelled very well too. They rode decidedly harder than bogie stock; there was a feeling of bustle and effort—it is rather like comparing the motion of a pony and trap to that of a limousine. As for gallant old No. 1, everyone at Stevenage agreed that she had excelled, and her crew deserve every praise for the way in which they got her along.



"The Flying Scotsman" of 50 years ago at Brookman's Park. Six-wheeled coaches of the type used in 1888 were used, and a speed of 56 m.p.h. was reached at this point. Photograph by E. R. Wethersett.

The train of 1938 is magnificent—there is no other word for it. The third-class compartments, tastefully decorated, might well be mistaken for "firsts"; their walls are adorned by coloured etchings so beautifully reproduced as to make one believe they are originals. As for the first-class compartments, sinking amid their cushioned splendour it would be quite easy, if one were so minded, to lose all suggestion of railway travel. The non-corridor carriages of the 1888 train produced a curious feeling of being boxed up. I felt I wanted to walk down the train and compare notes with friends, for one scarcely appreciates the amenity of the corridor until one travels in a train without one.

The modern "Flying Scotsman" has for long been famed both for the beauty of its restaurant cars and for the excellence of the cuisine, but there are many people nowadays who prefer a snack rather than an elaborate midday meal, and with them buffet cars have become very popular. The new "Flying Scotsman" is however the first train in which a buffet car has been run in addition to first and third-class restaurant cars. The buffet car is a very attractively appointed vehicle. The colour scheme is in shades of green, and with the restrained use of stainless steel the effect is reminiscent of the "Coronation" express.

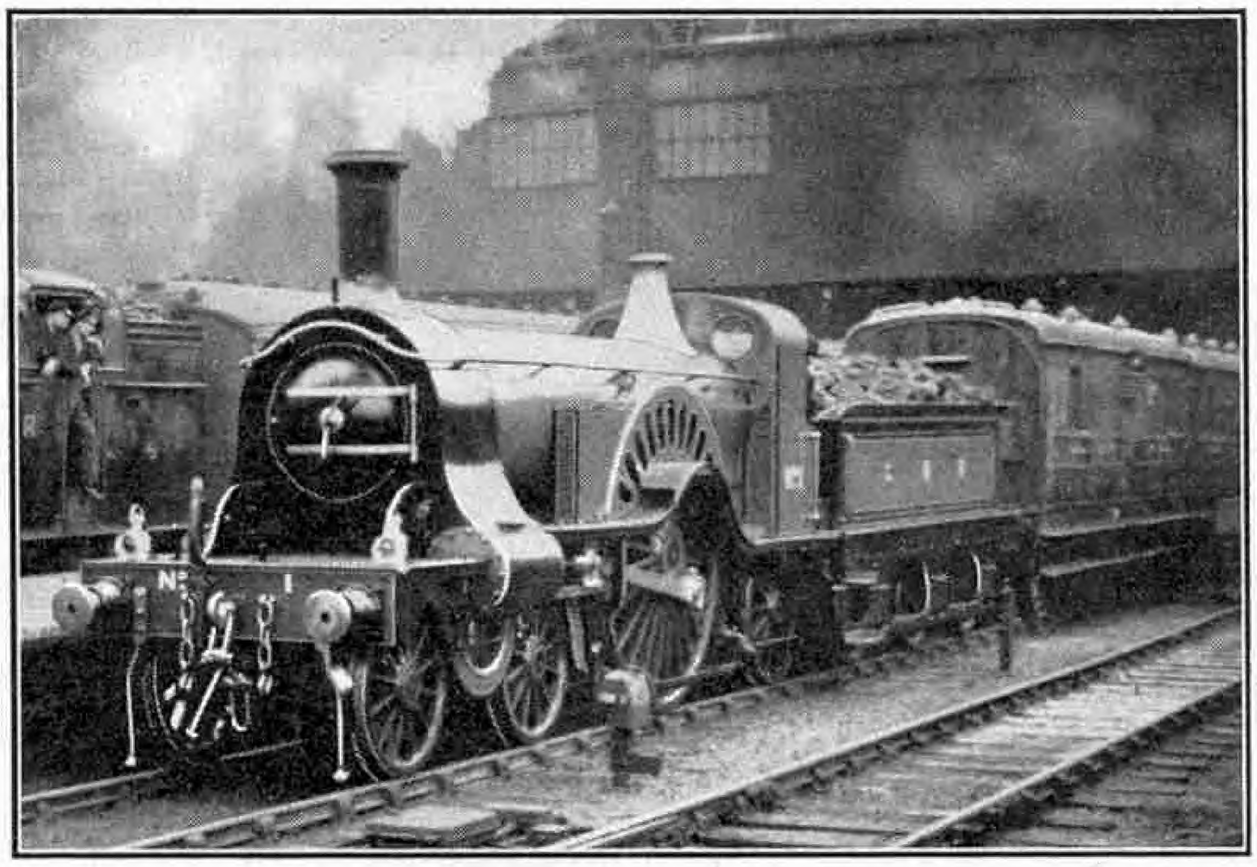
In order that passengers shall not be disturbed by others passing from front to rear of the train, a corridor has been arranged along one side; the partition is of glass, which not only makes the cafe portion very bright, but also provides a view of a surprising amount of the passing scene on both sides of the line.

The main restaurant cars are as usual, arranged as a triplet articulated set, with the kitchen in the centre, but the interiors deserve special mention. Some years ago an entirely new note was struck in railway carriage decoration by the equipping of the first-class restaurant car of "The Flying Scotsman" entirely in period French furnishings of the time of Louis XVI. The result was exquisite. The new cars are equally original, though decidedly modern in tone. The various bays in the first-class car are divided off by transparent partitions; these partitions are topped and edged by horizontal and vertical white beadings, and the effect is to give an impression of the square modern architecture of our own times.

The train is fitted with the Stone system of pressure ventilation. This, during cold weather, automatically warms the air to a comfortable temperature, and at all times supplies the whole of the train with fresh filtered air delivered at floor level by way of insulated ducts. The vitiated air is extracted by grilles into the roof duct which is connected to extractor ventilators. For those who prefer direct ventilation, deep sliding ventilators are provided with a large opening in each compartment and in the corridors.

We were soon able to appreciate the efficacy of the technical details of the new train, for the numerous photographers were so loath to part with such a fascinating contrast in rolling stock that our restart from Stevenage was somewhat behind time. To fit in with arrangements at Grantham it was rather important for us to be punctual, and so some very fast running was made, at any rate as far as Peterborough. The smooth and silent riding of the coaches during this spell was greatly praised while the engine-crew evidently welcomed this slight lateness as a golden opportunity for showing what locomotives of 1938 can do with a load of 510 tons. Our engine, appropriately enough, was the streamlined Pacific No. 4498 *"Sir Nigel Gresley,"* and she was manned by Driver W. Sheen, and Fireman S. Findley, of King's Cross shed; with them Inspector Jenkins, also of King's Cross, rode on the footplate.

With the 7-mile descent to Three Counties beginning immediately, Stevenage is naturally a grand place from which to start on a fast run. We were doing 80 m.p.h. six miles from the start, and touched 90 at Biggleswade; but what was far more impressive was the tremendous speed maintained over the gentle undulations beyond the foot of the bank. To sustain 88 m.p.h. on the dead level, as we did past Tempsford, with a load of 510 tons behind the tender was an extraordinary demonstration of what Sir Nigel Gresley's famous engines can do. We took the broken rise to St. Neots without going below 80 m.p.h., eased carefully to 70 m.p.h. round the curves at Offord, and then took the Stukeley Bank, 3¼ miles at 1 in 200, without going below 62½ m.p.h. A second maximum of 90 m.p.h. put the finishing touch on a time of 33 min. 6 sec. for the 43.1 miles from Hitchin to Fletton Junction; this average of 78.3 m.p.h. was all the more remarkable in view of the easing through Offord and the stiff subsequent climb.



G.N.R. No. 1 at King's Cross ready for its historic run 50 years after its triumphs in the railway races to Edinburgh. Photograph by L. Davies, Coventry.

So Peterborough, 47.8 miles from the start, was passed in the splendid time of 40½ minutes, and our lateness was entirely wiped out. The work from now onwards was not so exceptional, though No. 4498 did well to cover the 23.7 miles from Peterborough, passed at 15 m.p.h., up to Stoke summit in 25¾ minutes. The minimum speed on the 1 in 178 gradient was 53 m.p.h., and with a brisk descent afterwards the 76.9 miles from Stevenage to Grantham were completed in 72¼ minutes. We then ran gently out to Barkston Junction.

It was a happy thought, characteristic of the day's proceedings, to run the low-pressure non-streamlined Pacific No. 4472 *"Flying Scotsman"* alongside, while we were awaiting the turning of our own engine. Though not the first, No. 4472 is easily the most famous of the original Gresley Pacifics, and since the inauguration of the summer non-stop run to Edinburgh she must have hauled the train more times than any other engine in existence. It was good to see this old favourite during so notable a pageant of "Flying Scotsman" history.

Then, during tea on the way home, we were regaled by a glorious burst of speed. Re-laying at Grantham gave us rather a bad start, but after topping Stoke summit at 44 m.p.h. *"Sir Nigel Gresley"* got away with the surpassing swiftness one has come to expect of these engines. Just below Essendine

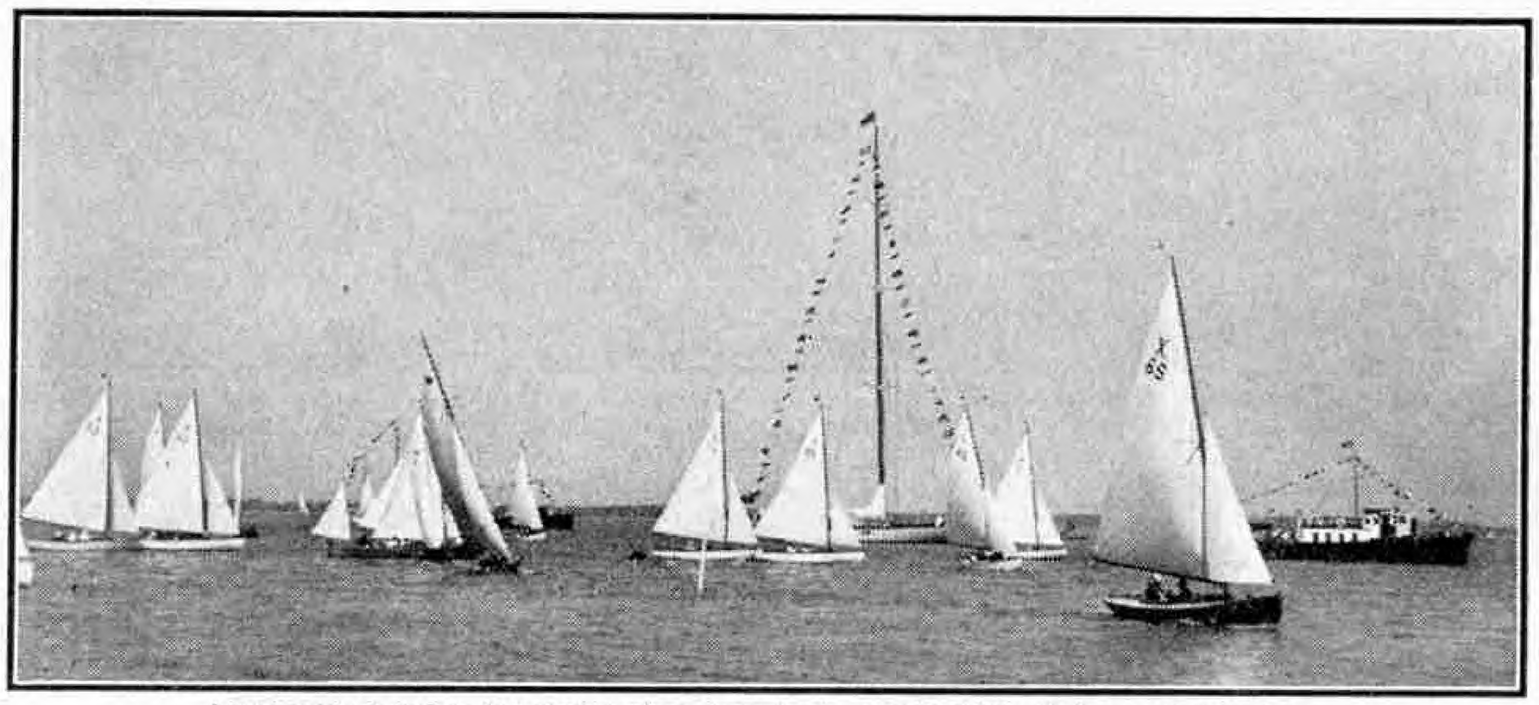
(Continued on page 478)

The Thrills of Yacht Racing

Fascination of a Great Sport

By Arthur Lamsley

THE sport of yacht racing has become so popular in recent years that it now takes over three hundred yacht and sailing clubs, situated around our richly indented picturesque coast, to organise the season's racing. Nor is yacht racing any longer the sport of the wealthy, for while a few yachtsmen can afford to build a £25,000 racing yacht, there are thousands of men and women of quite moderate means, in the professional and industrial classes, sailing boats costing from a modest £20 upward, who have grand sport for six months a year, from April to September.



Little ships racing in the Solent. These vessels are mostly of the "X" one-design class.

Sailing is a tense, highly competitive sport in which the prizes go to the helmsmen and crews who prove to be the most highly efficient in racing tactics and seamanship. Since most racing yachts to-day are built to International Rules, or One-Designs, which rate the size of the yachts in their respective classes practically equal, competition has become so keen that the only possible difference in hull speed is now dependent on the genius of rival designers entirely, and how much helmsmen can get out of their craft by clever sailing and racing tactics.

The King, Admiral of the Royal Yacht Squadron, is looked upon by all yachtsmen as their Commodore. His Majesty, Naval-trained, realises the need of extending the sport of sailing amongst Youth, and to-day inter-school and inter-collegiate sailing matches have his encouragement and practical support. The King urges that a seafaring people must encourage its Youth to use the coastal waters far more extensively as their natural playground, and in this matter follows the inspiring example of his Father, King George V, whose love of sailing laid the present great popularity of yacht racing.



"Blue Martin," "Little Astra" and "Trivia," of the International Twelve Metres class, racing for the mark boat.

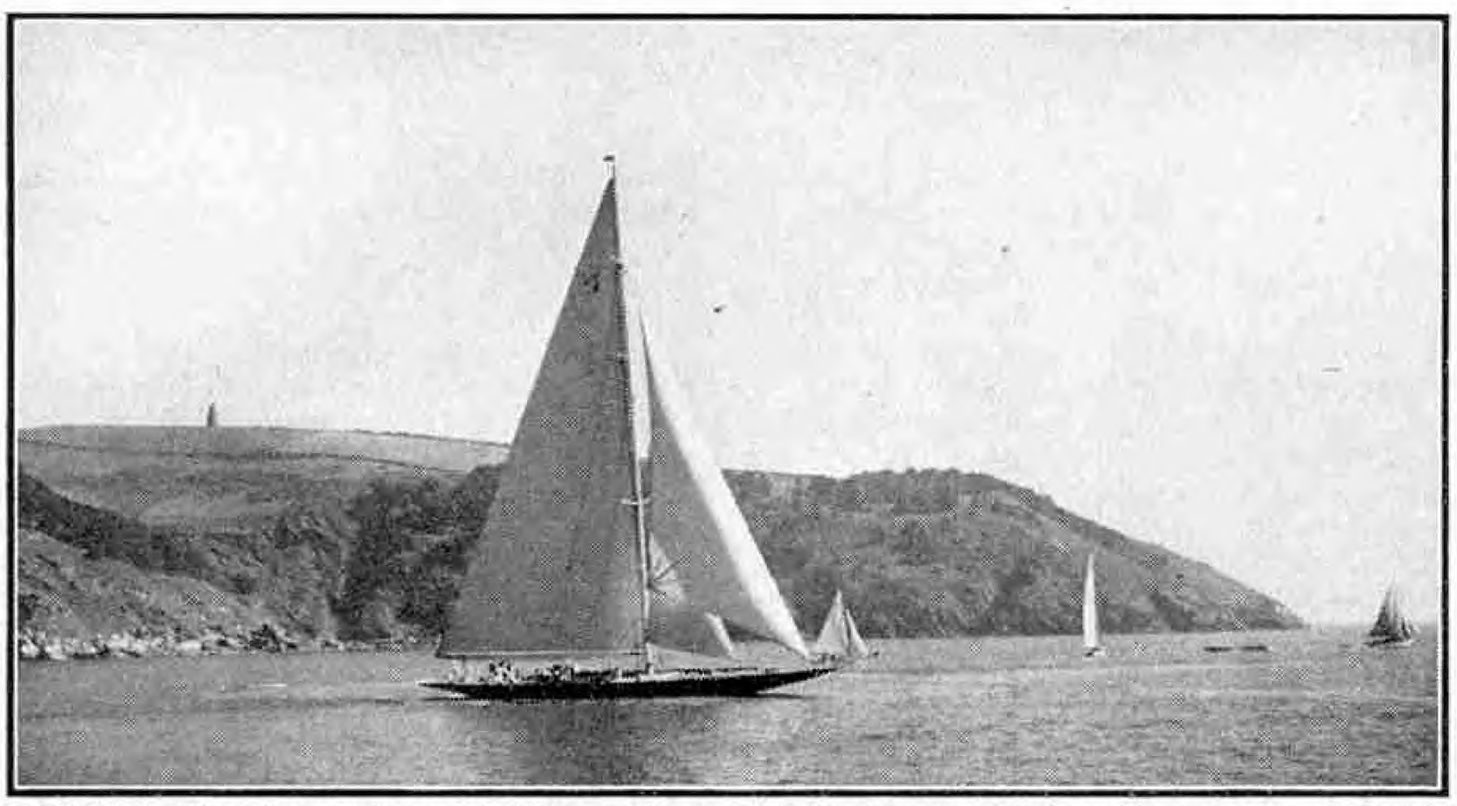
King George V was thrilled with yacht racing. I remember one terrific struggle between *"Britannia"* and the schooner *"Westward"* in Spithead, when these gallant craft raced all out in half a gale, plunging into big, broken seas for fifty miles. I raced aboard the *"Westward,"* and had a unique opportunity of watching the King's tense enjoyment. Every moment of the great race was a thrill, the yachts challenging and counter-challenging each other for the absolute leadership. Five hours' intense struggle brought no result—the epic race ended in a dead-heat. The King was the first to lead the cheering for his gallant rival as soon as the finishing-gun boomed and the result known. It was an unforgettable moment—a thrill only sailing can give. I wrote a description of this race in one of my books, *"Sea Lure,"* and the late King graciously sent a message of congratulation to me by his Sailing Master for my graphic story of the race.

There are many different classes of yachts racing to-day in British waters, and each year new classes appear. This season the Thirty Square Metres has made its first appearance in British regattas, although this class is popular in Europe and the United States. The principal classes racing are: "J" Class, of the *"Endeavour"* type; International Twelve Metres Class, like *"Marina"* in photograph; the Eight Metres, Six Metres, Thirty Square Metres; "Q" Class of ex-Six Metres yachts; Dragon Class, a most popular small racer introduced from Europe during the past three years; West Solent One-Design Class; Teal O–D Class; about 700 registered 11 ft. International Dinghies; Snipes; Tumlaire Class, Victory O–D Class; and a local One-Design Class in most yachting centres. Besides these inshore racing yachts there is a very big fleet of ocean racers belonging to the Royal Ocean Racing Club, which think nothing of racing hundreds of miles in open sea.

Handicap racing is on the increase; that is older yachts race with new ones, and the older ones are allowed a time allowance in seconds per mile according to the race course and the weather. Handicapping is arranged for

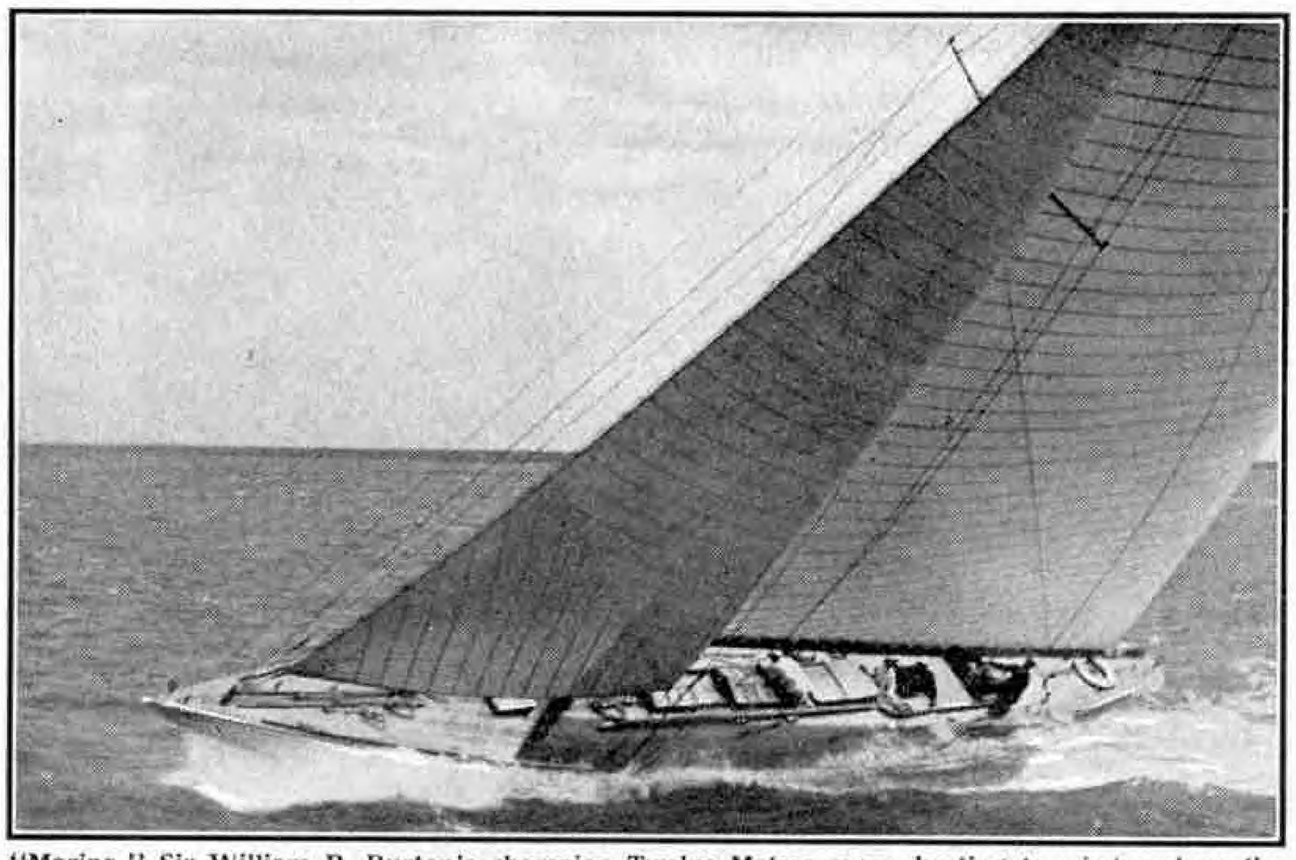
light, medium, and strong winds. An old yacht might be better in a big breeze than a new yacht, and therefore various scales of time-allowance are used. In many of the smaller classes racing is on a handicap basis, especially where most of the yachts have never been designed to any particular class.

In a yacht race there is a warning gun ten minutes before the start, a five minutes' gun, and the starting gun. A yacht must not be over the starting-line before gunfire, or she is recalled and made to cross the line again. The art of starting a race is for the helmsman to accurately judge his time, to a split-second, and cross as near gun-fire as possible. Also, a helmsman will try to start on the weather end of the starting-line, that is the end of the line from which the wind is blowing. This enables him to keep to windward of his rivals, and be first, if he is smart enough, when rounding the first mark.



"Endeavour II" racing off Dartmouth. The ex-America's Cup Challenger is a "J" class yacht and cost £25,000 to build and equip for racing. She is of steel, and has a 163 ft. steel mast.

Yachts racing to windward tack to port and starboard to fetch the mark. On no account must a yacht sailing on the port tack, that is with the wind on the left side of the craft, hamper a yacht racing on the starboard tack, that is with the wind blowing on the right side of the craft looking toward the bow. If she does this, it constitutes a foul, and the offending yacht is disqualified. A yacht racing on the starboard tack has always the right of way. When running free, that is with the wind on the port or starboard quarter, or coming up astern, yachts must keep clear of each other; and an overtaking yacht must keep clear of those she passes in the race. A yacht is raced close-hauled, that is with her sails taut and sheeted close so that she may sail into the wind's eye as near as she can. The finest racing yacht possesses the best qualities of being able to sail nearly into the wind's eye, or very close to the wind. It is impossible to sail absolutely into the wind, but a good yacht can sail very near it.



"Marina," Sir William P. Burton's champion Twelve Metres racer, beating to windward on the starboard tack. Sir William is President of the British Yacht Racing Association.

On the day of the race the yachts cruise about near the starting-line, lazily waiting for the ten-minute gun. It booms! Helmsman and crew are electrified, spurred into tense activity, and the yacht, seeming to understand, scents the race and strains on her white wings. The five-minute gun booms. Sails are now trimmed and set for the first leg of the course. There is an awesome silence on board, broken only by the sharp orders of helmsman, and the time-keeper's warning of the speeding minutes to the starting gun. Three, two, one minute, thirty seconds, ten seconds, five seconds, one, gun! We're sailing away, bow to bow with a fleet of rivals, cutting the line a few seconds after the gun. Into the wind's eye we sail, tacking port, starboard, port, starboard, till we fetch the weather mark. The helmsman making the best and most accurate tacks takes the mark first, in the lead of the racing fleet, and on rounding it eases sheets, sets spinnaker and runs before the sporting breeze, on to the next mark.

There is no greater joy than being seated at the helm of a racing yacht, measuring a distance to a mark, judging a slant of wind, taking the challenge and counter-challenge of sporting rivals. It is the finest sport known to man. Its very uncertainty adds to its thrills. A capricious wind might rob a helmsman of the coveted prize almost on the finishing line, although he might have had a good lead. Sailing aboard the 23 Metres "*Astra*" during the Silver Jubilee Cup Race at Cowes, it seemed that, try as we would, our gallant craft must be last. Then ten minutes from the end of the race we picked up a romping breeze, coming up aft, and setting a big spinnaker we raced away on the run at a tremendous speed. Soon overhauling the rest of the fleet, leading by nearly a quarter-mile, we came up abeam and carried the wind right through their lines; and although they picked it up and sailed fast, "*Astra*" got her nose ahead and won by a matter of seconds.

Another time, racing aboard "*Velsheda*" for the King's Cup, the luck of the game, and not a little patience in the zones of calm, won the most coveted yachting prize in the world after the America's Cup. The fleet started beam to beam on a 42 nautical miles' course. It was a day of capricious winds, never blowing steady from one quarter. Our helmsman watched the water with trained eyes for the merest ripple to show where the breeze was strongest. "*Velsheda*" nosed up to it and sailed away, only to be be-calmed again an hour later and lose a valuable lead. This tedious sailing, but none the less exciting racing,

(Continued on page 478)

Locomotive Giants in the United States

Hauling Trains of Over 11,000 Tons

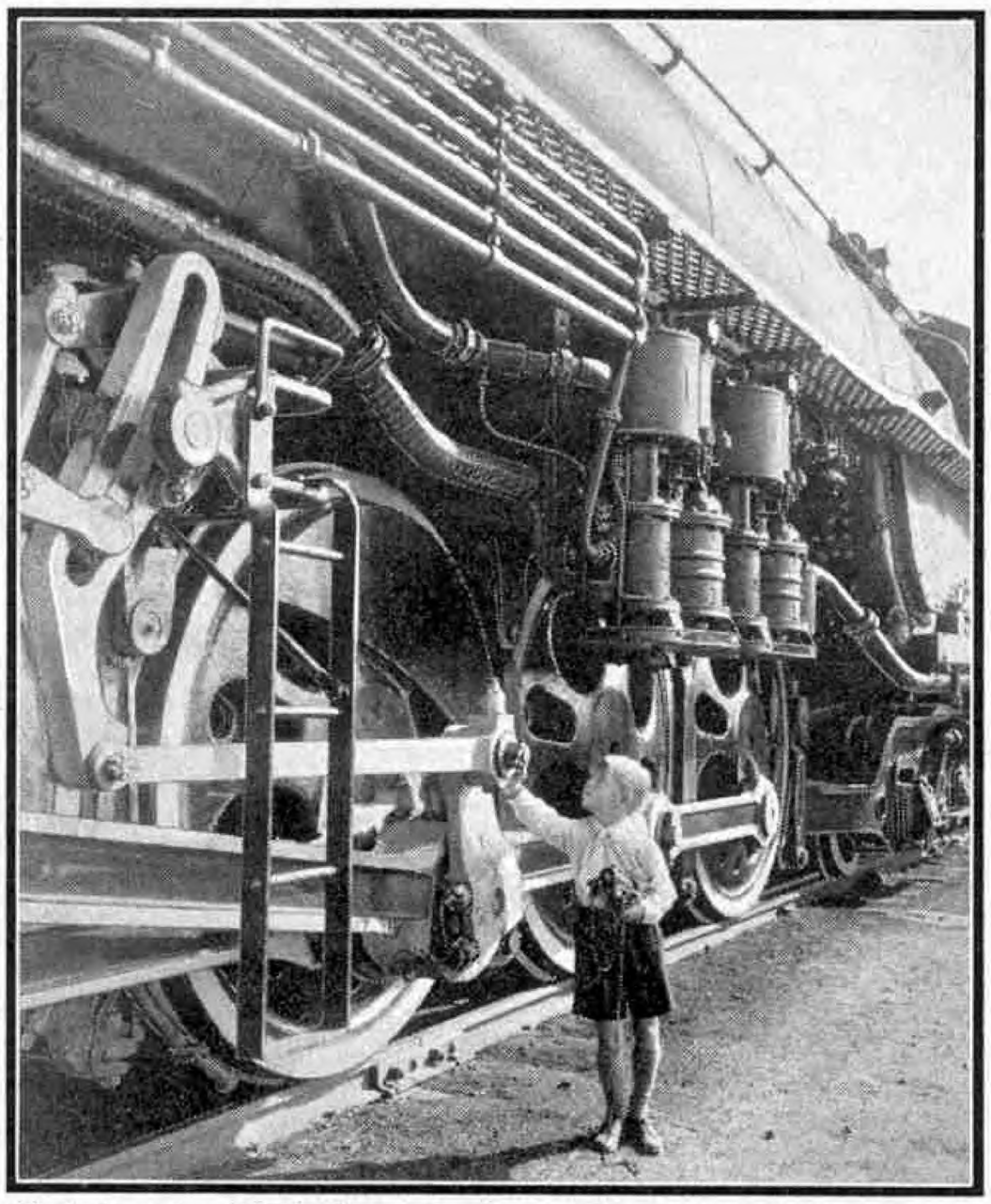
By H. Coble

RAILWAY operating conditions in North America differ considerably from those in this country, the greater weight of both passenger and freight trains there, with the numerous severe slacks and difficult gradients, calling for locomotives with an immense reserve of power. In recent years many changes in design and constructional details have been brought about, chiefly by the need for increased power for handling increasingly heavy trains at higher schedule speeds, and in this article are described and illustrated a few of the outstanding giant locomotives now employed in passenger and freight service in the United States.

The chief feature of the modern high-powered American locomotive is its immense boiler capacity, which has necessitated the modification of many wheel arrangements previously standard. Steaming capacity to maintain the great power now required at high speeds is all-important, and for this reason large boilers are necessary, with fire-boxes and fire-grates of corresponding size. It is interesting to note that the tractive force developed by most new types shows little increase over that of locomotives built 10 or even 15 years ago. At high speeds however the larger boilers and fire-boxes allow the sustained development of the power of the engines.

One interesting result of the use of larger fire-boxes has been the introduction of the four-wheeled trailing truck, with its greater carrying capacity in comparison with the two-wheeled trailer. For instance we find the 4–6–2 or "Pacific" type of engine rapidly being superseded by the 4–6–4, the 4–8–2 by the 4–8–4, the 2–10–2 by the 2–10–4, and so on.

A notable feature of modern American construction is the one-piece locomotive bed or frame. This includes the main frames, valve chests, cylinders, smoke-box saddle and numerous other parts that were previously built up from separate components, but are now cast in one unit. Another interesting innovation is the increasing use of roller bearings to reduce friction, as well as maintenance costs. They are used not only for the tender wheels and locomotive trucks, but in some cases for the axles of the coupled wheels also. These are only a few of the novel points in design that are directly responsible for the high sustained power that is built into the American locomotive of to-day. Most of these features are employed in the engines described on this and the following page.



Admiration! A youthful railway enthusiast gazes in wonder at the towering mass of a modern American 4-8-4 locomotive. The engine belongs to the Northern Pacific Railway, by courtesy of whom this photograph is reproduced.

Among the largest passenger engines so far built are 10 magnificent 4–8–4 locomotives of the "A2" class, placed in service on the Northern Pacific system for working the heaviest passenger traffic. This includes hauling the *"North Coast Limited,"* a famous air-conditioned train that runs between Chicago, St. Paul and the north Pacific coast. This duty involves one of the longest runs in the world in which the same steam locomotive is used throughout, for no change is made between Jamestown in North Dakota and Missoula in Montana, a distance of 906 miles, and the illustration on this page gives a good idea of the vast character of the engine and the generally massive construction of the motion parts.

The "A2s" were built by the Baldwin Locomotive Works in 1934. They are 109 ft. 5½ in. in length, stand 17 ft. 4 in. high at the chimney, and in full working order weigh 391¼ tons. Their tractive force is 69,800 lb. The boiler, the least internal diameter of which is 88 in., has a total heating surface, including superheater, of 7,138 sq. ft. In using roller bearings on the 28 wheels of the engine and tender, the roller-bearing principle has been extensively adopted for the first time, with very promising results. The bed or frame of these engines is an immense affair of cast steel, weighing some 35 tons.

Other interesting points of the "A2s" are the driving wheels, which are of the pattern known as the "Boxpok," the wheel centres looking like slotted discs. This form of construction saves weight with no sacrifice of strength, and its characteristic appearance can be seen in the illustration on this page.

The 12-wheeled tender turns the scale at 173¾ tons. It is cylindrical in shape, and has a capacity of 24 tons of coal and 20,000 gallons of water. Firing is carried out by means of a mechanical stoker capable of feeding over 11 tons of coal per hour to the fire grate, which has an area of 115 sq. ft.

Last year 14 oil-burning engines of the 4–8–4 wheel arrangement were delivered to the Southern Pacific Lines by the Lima Locomotive Works. It is claimed that these are the largest streamlined locomotives in existence. They have a startling exterior appearance, the streamlined casing being finished in red, orange and black bands, with an aluminium smoke-box door, and the use of oil fuel makes it possible to keep them in spotless condition. In working order these streamliners weigh 371 tons 18 cwt., the engine alone weighing 205 tons 8 cwt.

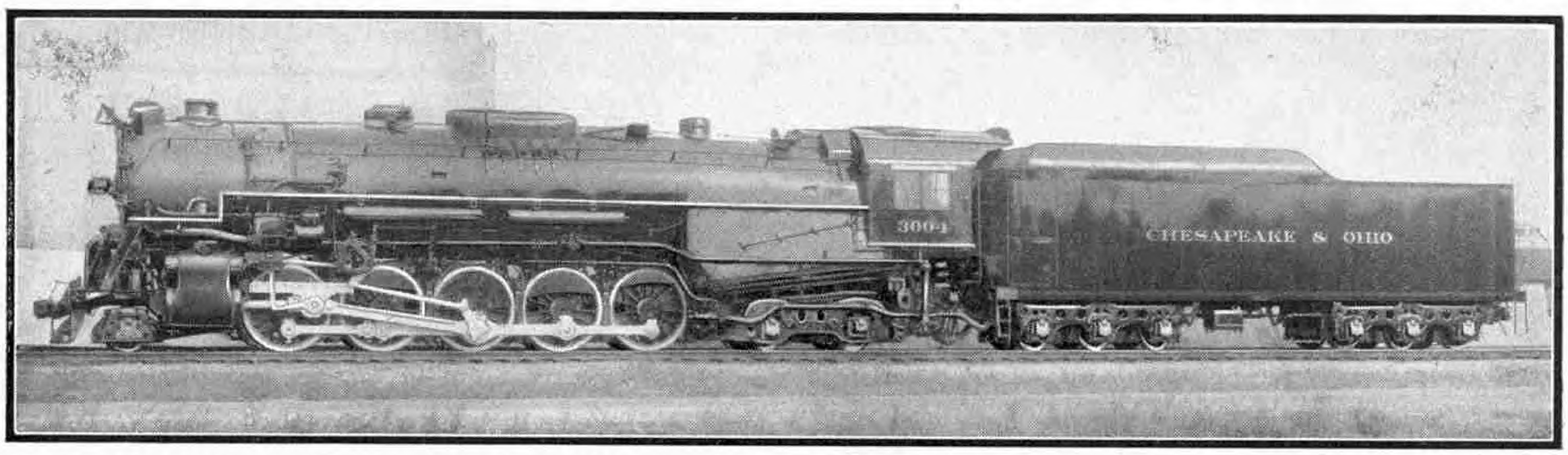
The tenders fitted to this class are the largest in use on the Southern Pacific Lines at the present time, their tanks being capable of holding 22,000 gallons of water, and 6,010 gallons of oil fuel.

Many other railroads in the United States have in service locomotives closely approaching in size and power the two types already mentioned. For example there are the Chesapeake and Ohio Railway's five 4–8–4s of the "T. H. Jefferson" class, also built by the Lima Locomotive Works, which operate the principal expresses of the system, including the famous *"George Washington"* trains of the latest all-steel air-conditioned Pullman cars. The engines work between Hinton, West Virginia, and Charlottesville, Virginia, a distance of 175 miles. This includes the crossing of the Allegheny and Blue Ridge mountains, and many of the gradients on this section of the line are from three to eight miles in length. The five engines of the class bear the names of personages of historical note connected with the region through which the Chesapeake and Ohio route runs.

The "T. H. Jefferson" class of locomotive has been designed to provide the maximum boiler power that could be obtained within a loading gauge 15 ft. 6 in. in height, and still allow adequate clearance over the 6-ft. driving wheels. Each of these fine engines with its tender weighs 383 tons, and it has been calculated that they can develop 5,000 h.p. in the cylinders.

The capacity of many modern 4–8–4 designs is so great that they are classed as dual-purpose locomotives, and handle both passenger and freight traffic in spite of the large diameter of their coupled wheels. A good instance is the "H" class of the Chicago and North Western Railway, engines rated to haul 26 all-steel Pullman cars at 85 m.p.h., or 150 freight cars at 50 m.p.h., on a level track.

The real monsters of the locomotive family are found in the heavy freight engine class, however. One is the giant Mallet articulated



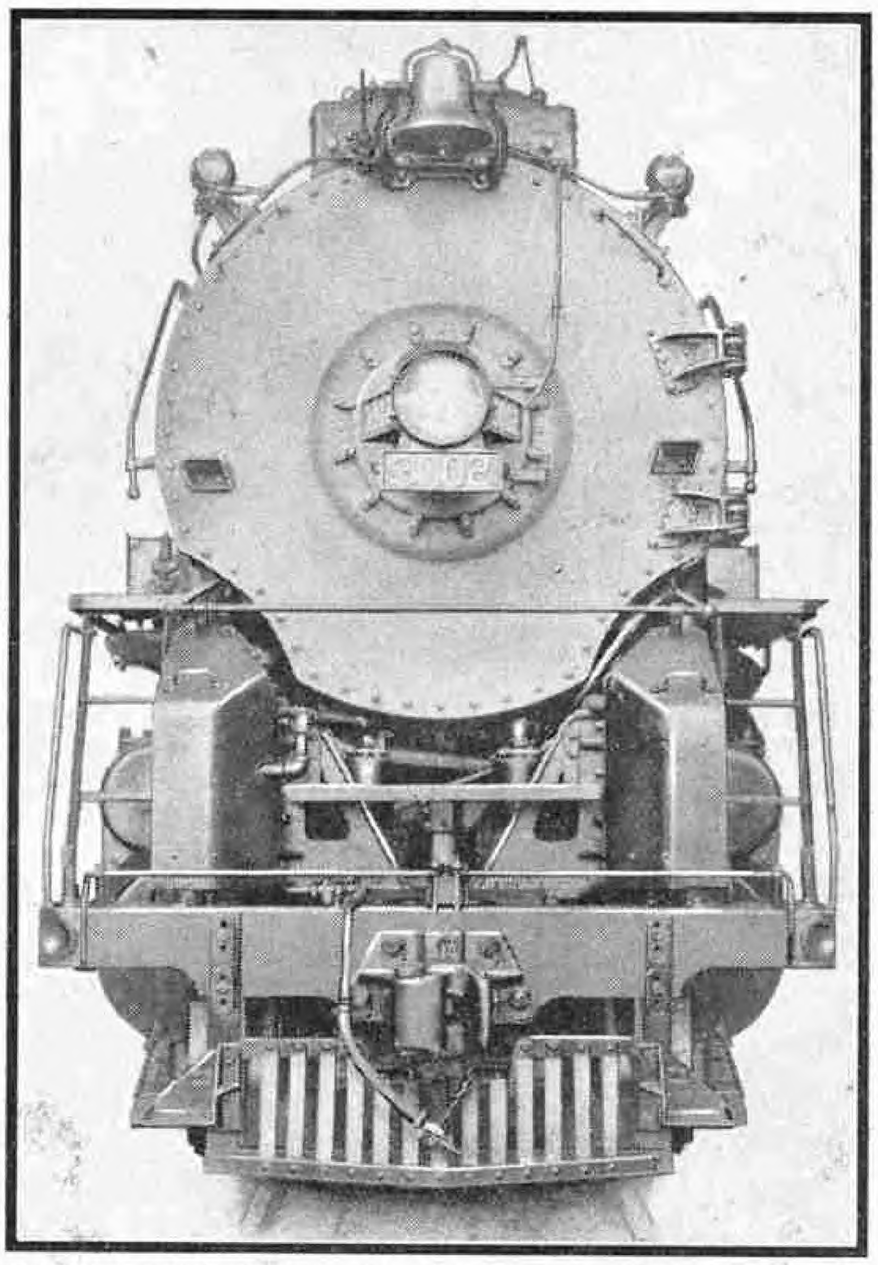
A monster 2-10-4 locomotive of the Chesapeake and Ohio Railway. The engines of this class weigh 437 tons 15 cwt. with tender, and are the heaviest and most powerful non-articulated steam locomotives in the world. This and the lower illustration on this page are reproduced by courtesy of the Chesapeake and Ohio Railway.

engine of the Norfolk and Western Railway with the wheel classification 2–6–6–4. Eight years ago this railway put into service a 2–8–8–2 Mallet engine, which with its tender weighs 423 tons 7 cwt. and has a boiler 96 $\frac{5}{16}$ in. in diameter, a total heating surface of 7,403 sq. ft., and a fire-grate area of 106 sq. ft. Yet the same railway's new 2–6–6–4 high-speed freighter, built in 1936, has a boiler 104 in. in diameter with the enormous heating surface of 9,353 sq. ft. and a fire-grate 122 sq. ft., a very substantial increase indeed. Even then the new engine in full working order weighs only two tons more than the older "Y5" class! This is a remarkable instance of the improvements made in locomotive design and construction, even over such a short period as six years.

This giant 2–6–6–4 "Mallet" is one of the finest examples of the high-speed freight locomotive yet built. It is modern from stem to stern, with roller bearings on all axles, and driving wheels with a diameter of 70 in. It can attain a speed of 60 to 65 m.p.h. on favourable stretches of the line, and the operating department of the Norfolk and Western Railway claim that with it they can provide a freight service little inferior in speed to the express passenger trains.

This type of engine is known as the "A" class and was designed and built in the Norfolk and Western workshops at Roanoke, Virginia. It is 120 ft. 7$\frac{1}{2}$ in. long and has a tractive force of 104,500 lb. The boiler has a working pressure of 275 lb. and its fire-box is of particular interest, being electrically welded throughout. The enginemen who drive it literally need no oil can, for oil is pumped mechanically to all sliding and other parts, making the engine remarkably quiet and smooth running. Its two huge cast steel bed plates weigh 49$\frac{1}{2}$ tons each, and the use of these castings instead of the conventional built-up frames, cylinders and so on has eliminated 700 major and minor parts!

On trials this wonderful locomotive gave an astonishing performance, developing 7,700 i.h.p. at 45 m.p.h., the highest figure ever recorded by a steam locomotive. For the benefit of those readers who like astronomical figures it has been estimated that employees of the railroad worked approximately 91,400 man-hours, or 11,430 man-days, in the construction of the first two engines of the class!



This front-end view of one of the Chesapeake and Ohio 2-10-4s gives an excellent impression of the large diameter of the boiler and the height of the engine.

The largest and heaviest steam locomotive in the world is an articulated engine of the 2–8–8–4 type weighing 501$\frac{1}{2}$ tons with tender, the engine weight alone amounting to 322 tons. There are 12 of these monsters, known as the "Yellowstone" class, on the Northern Pacific Railway, and they were designed to haul 4,000-ton freight trains over a very severely graded 216-mile section of the line that penetrates the Rocky Mountains. These trains are twice as heavy as those previously hauled over this division by the huge 2–8–2s of the railway.

The engines have four cylinders, each 26 in. in diameter by 32 in. stroke, and the maximum tractive force with the booster in operation is 153,900 lb. The boiler has a maximum diameter of 110$\frac{1}{2}$ in. and is the largest ever mounted on a locomotive chassis, its empty weight being 74$\frac{1}{2}$ tons. When the engine is working at full capacity nearly 20 tons of coal per hour are fed on the 182 sq. ft. of the fire-grate by the mechanical stoker, and in the same time 62 tons of steam at the working pressure of 250 lb. per sq. in. are generated. The fire-grate is really larger than would be necessary if high-grade fuel were available, but the locally mined coal used by the Northern Pacific is of very low calorific value.

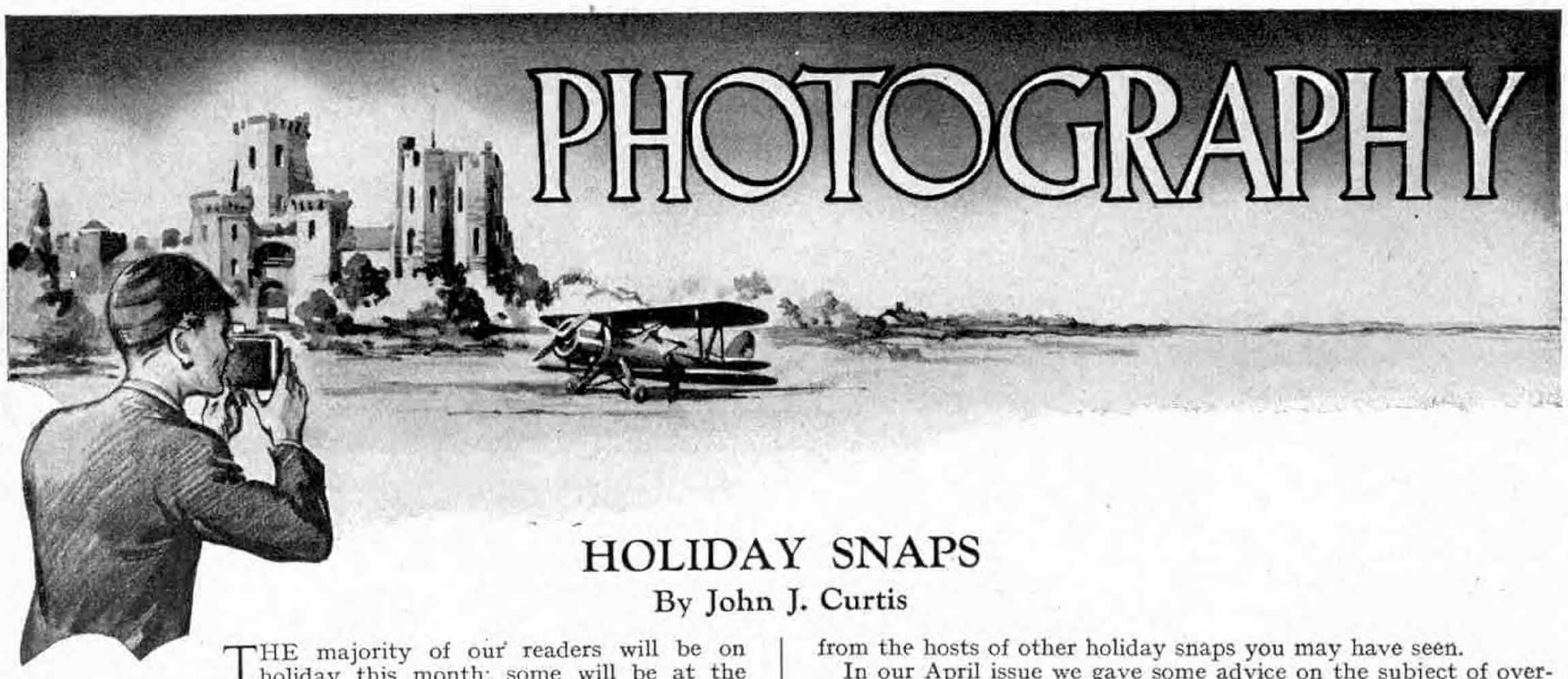
Returning to the non-articulated types, the upper illustration on this page shows one of 40 gigantic high-speed freight engines of the 2–10–4 wheel arrangement built for the Chesapeake and Ohio system. The lower photograph reproduced on this page gives some idea of the impressive appearance of one of these great engines when seen head-on. They are known as the "T-1" class, and their appearance caused considerable stir in railway circles, for in all-round dimensions they were the largest two-cylinder locomotives ever constructed. At the time of writing they still remain unchallenged as the largest, heaviest, and most powerful non-articulated engines in service anywhere in the world.

In working order, these mammoths weigh 437 tons 15 cwt., and their tenders, which are the largest yet built, each scale no less than 185 tons 5 cwt., and have accommodation for 27$\frac{1}{4}$ tons of coal, and 23,500 gallons of water. It is interesting to note that this monster vehicle weighs considerably more than any complete British locomotive, and the largest tender in use in this country carries only nine tons of coal.

The boiler of the "T-1" class is one of the largest ever used in a steam locomotive. It works at a pressure of 260 lb. per sq. in. The tractive force of the main cylinders is 93,350 lb., and this can be increased to 108,623 lb. by a very powerful two-cylinder booster.

The Chesapeake and Ohio Railway carried out some very interesting tests that demonstrated in no uncertain way the tremendous capacity of their 2–10–4s. A train made up of 141 loaded coal cars and a dynamometer car, making a total load of 9,770 tons, was hauled over the 236-mile section of the line between Russell, Kentucky, and Toledo, Ohio, in the remarkable time of 10 hrs. 42 min. This time does not include stops for refuelling, and gives an average speed of just over 22 m.p.h. At a later date an even heavier train consisting of 212 vehicles was successfully hauled.

During these trials, the dynamometer car recorded some phenomenal figures. One of the engines developed 5,341 i.h.p. for more than 1$\frac{1}{2}$ hours, at speeds varying from 29 to 39$\frac{1}{2}$ m.p.h. The maximum recorded figure was 5,681 i.h.p., a performance that fairly takes one's breath away! In regular service the locomotives have demonstrated their ability to haul 159 loaded coal cars and a caboose, making a total weight behind the tender of 11,380 tons. Such spectacular achievements show what can be accomplished by modern steam power with the developments made possible by the generous construction gauge and the high axle loading allowed by the permanent way in the United States.



HOLIDAY SNAPS

By John J. Curtis

THE majority of our readers will be on holiday this month; some will be at the seaside, others in the country on farms or in camp, and yet others will be cruising. No matter what form the holiday may take, it will present countless opportunities for using a camera, and in days to come those holiday photographs will help their owner to live again the fun and happiness of his 1938 holidays. What could be more appropriate then than to devote this month's photographic pages to holiday photography?

The majority of boys who take cameras away on holiday think only of securing a few "snaps" that will help to show their friends what a jolly time they have had. They will return home with a bundle of pictures such as seaside views, variously labelled "Billie Diving," "Mary having a Donkey Ride," and the high spot of the collection will be the "snap" taken just as Dad awakened from a stertorous post-luncheon nap to find Billie dangling a wriggling crab over his wide open mouth! If they have been to camp they will produce pictures such as "Mother prepares Breakfast," "The Pyjama Parade" or "Dad c. Napping b. Billie Goat."



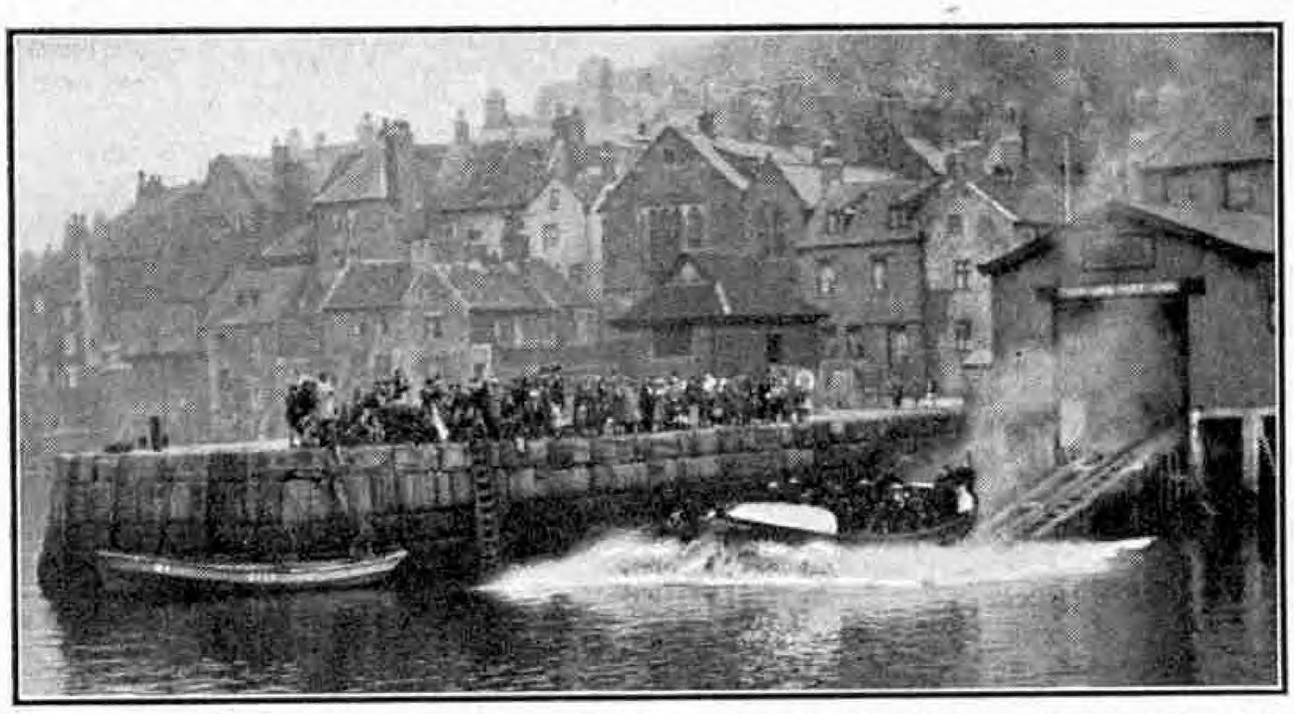
"The Nigger Minstrel." This splendid beach snapshot, taken at Hoylake, Cheshire, by A. G. Dell, West Norwood, S.E.27, was awarded First Prize in the A Section of the July Photo Contest.

Other boys, who take their photography more seriously, will set out wholeheartedly to compile a pictorial record of their holiday and will return home with a load of spools of film, which when developed will provide collections of views, seascapes, waterfalls, woodland glades, old churches, lych gates and the like.

It does not matter a jot in which group the individual reader falls. Each one is collecting the incidents and items of interest that will help him to live that holiday once again, and our advice to him is: Go right ahead! Use as many films as you can. Every single one will be well worth while, if you will take just that little bit of extra trouble to get the "unusual viewpoint" and make your pictures different from the hosts of other holiday snaps you may have seen.

In our April issue we gave some advice on the subject of overhauling a camera before use after a long period of idleness. Apparatus that was last used at the seaside a year ago almost certainly will require a little preliminary attention, and it is better to give that attention beforehand rather than find that a first spool of film has been spoiled by, say, a faulty shutter mechanism. We almost wish there could be a law making it compulsory for every photographer to make sure his camera is working properly before going on holiday. It would save a lot of wasted film.

Photography with modern cameras and films is so absurdly simple that there is really very little left for the photographer to do, except to take care of the exposures and the viewpoints. Not even the most elaborately fitted camera can produce good pictures unless the user allows adequate exposure times. Most photographers take the trouble to get to understand the working and little tricks of their cameras, but it is no less important to get to understand the special qualities of the film in use, and it is a sound plan to choose one good make of film and to stick to that brand throughout the season. There are several excellent makes advertised in the *"M.M."*, such as Selochrome, Verichrome, Sensichrome, Zeiss-Ikon, all of which are easy to use and sure of giving good results if properly used.

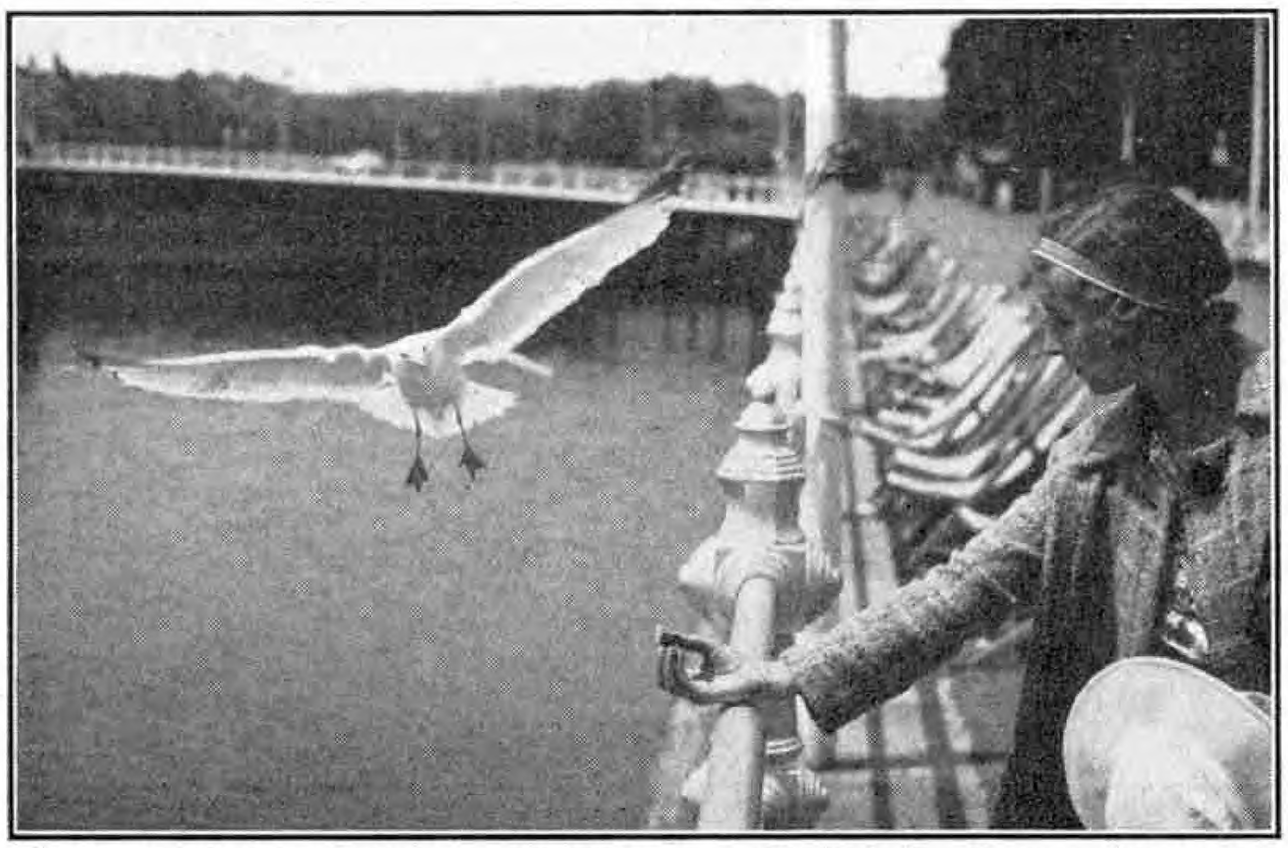


"Launch of the Lifeboat, Whitby, Yorks." This is another excellent holiday snapshot, entered in our photographic contests by Barry Homer, Birmingham.

The next step is to abandon the habit of guessing the exposure time. One of the most reliable exposure calculators we know can be bought for less than the price of the film wasted by a dozen bad guesses! This is the calculator embodied in the handbook published by Messrs. Burroughs Wellcome and Company. It is remarkably easy to use, for special tables are provided for each month of the year, each hour of the day and for varying weather conditions. These tables, used in conjunction

with the speed of the film and the size of the camera stop employed, point clearly to the correct exposure for any and every occasion. The only point on which the photographer is required to exercise his own judgment is in regard to the subject, and the Wellcome calculator simplifies even this. Various types of subjects are illustrated so clearly in a series of small photographs that it is almost impossible to go wrong.

There will be a few readers who may take the view that as they use their cameras only for a few days each year, the cost of even an inexpensive exposure calculator is hardly justified. Such readers must be prepared to find their results of a "hit or miss" nature. The following rough guide will help them, however, On sunny days, between 11 o'clock and 4 o'clock, an exposure of 1/25 sec. at stop F/16 should give a reasonably full exposure. If the subject is a brilliantly lit beach scene, however, 1/50 sec. will be ample. Before 11 o'clock and after 4 o'clock, the same exposure times may be given but the next larger stop, F/11, should be used. The modest-priced box-form camera usually has only one snapshot exposure speed and two sizes of lens aperture. With such cameras on bright days the smaller aperture should be used between 11 o'clock and 4 o'clock, and the larger one at other times. On dull days, the larger aperture should be used at all times. During the later hours of the morning and the early afternoon hours at the seaside, the brilliance of the light, due to the clearness of the air and the strength of the light reflected from the sea and sky, makes it almost impossible to under-expose even with the cheapest form of camera.



"Come and Get It." Another typical seaside holiday snapshot that gained a prize in our photo contests for A. B. Bishop, Bristol.

A tremendous number of films are wasted each year on subjects that are beyond the power of the camera to reproduce satisfactorily. The sea and its breaking waves, for example, have a fascination all their own but it is seldom possible to make a really good picture of a wide expanse of open sea. The results are much the same with stretches of wide open country and moorland. The fact is that the camera cannot adjust itself, as does the human eye, to deal adequately with large areas. Consequently distant objects in a photograph are so dwarfed as to be without interest. Special and very expensive camera equipment is necessary to overcome this disadvantage and readers who do not possess such apparatus would be well advised to leave these subjects alone. The only effective sea-scape pictures are those that have some prominent object, such as a boat or large rocks, in the foreground.

The secret in photographing breaking waves is to hold the camera low down, the lower the better. In this way the waves are made to appear much larger than they actually are. The camera should not be pointed straight out to sea so that the waves appear as a series of straight lines across the picture. The effect is much better when the waves are travelling at an angle across the viewpoint. Very striking pictures can be obtained when high seas are breaking over rocks, and readers should be on the lookout for opportunities of this kind.



"Tuck in Your Tuppenny." Leap-frog, a popular beach and camp game, provides many splendid action pictures as this illustration, by courtesy of Ilford Ltd., shows.

Those boys whose holidays are to be spent at resorts with low and sandy coast lines need not despair. They will find ample subject matter in busy beach scenes with their big variety of amusements such as model yacht sailing, speed boat racing and the inevitable donkey riders. It is rarely worth while trying to take general views on a crowded beach. The interest is too scattered. It is desirable always to find some special feature of the crowd—a particularly jolly family party, a strolling musician, a picturesque old boatman, for example—and arrange the picture so that feature stands out. The rest of the beach scene will then seem to be just a background, contributing an atmosphere to the picture.

Yachts and sailing boats with their graceful lines and billowing sails make splendid subjects for the camera. Broadside or bow-on views are rarely satisfactory, however. A three-quarter view, or one with the yacht approaching on a course that will take it diagonally across the camera's line of view, gives a much better effect. A splendid yachting photograph is reproduced on our front cover this month by courtesy of Ilford Ltd. Boys holidaying on the broads will find very attractive subjects among the old wherries and sailing barges. They make striking pictures particularly when the viewpoint permits the inclusion of reflections from the water.

Readers who are spending their holidays in country places also will find that they will have little difficulty in getting ample snapshot exposures in bright weather, particularly on views and incidents in open country away from the shade of trees or buildings. Special care must be taken, however, when photographing woodland scenes, subjects that are very tempting, particularly when a stream or a waterfall is included. Considerable allowance must be made for the reduced strength of the light under trees. The human eye adapts itself to the change so readily that the weakness of the light is hardly noticeable, but the camera cannot register the picture faithfully without a comparatively lengthy exposure. It is in conditions such as these that the exposure calculator proves its worth.

Camping holidays, whether at the seaside, among lakes and hills, or in the country, provide a host of good camera subjects, apart from the pictures obtainable in the camp surroundings, but care must be taken to avoid too great a similarity of background. In organised camps, the weekly sports day, for example, will provide a lot of pictures. In attempting a picture of a flat race in progress, the viewpoint must be arranged so that the runners are snapped when travelling toward the camera, not across the field. Otherwise, the movements of the runners will be too fast to enable the average camera to record a sharp impression. The obstacle race can usually be relied upon to offer opportunities for funny snaps, and the best place for these is alongside one of the obstacles.

Quite a large number of our readers will spend a touring holiday this year and will visit some of the ancient buildings and cities of Britain. They must remember that a few simple precautions must be taken in dealing with architectural subjects. For example, the camera should not be pointed directly at a window. Light reflected from the window is almost certain to cause what is known as halation. The camera must be held perfectly level when taking a picture of a tall building, such as a church tower. If the viewpoint makes it impossible to include the top of the building without tilting the camera upward, another viewpoint must be found. Otherwise, the perpendicular lines of the building will be hopelessly distorted and will seem to fall about all over the picture. We do not accept entirely the old saying "It is better to omit than to distort," but it is a good maxim when dealing with subjects of this type.

Finally, a word as to changing films out of doors. This must be done in the shade if possible, so as to avoid any possibility of light getting to the film and "fogging" it. If no other shade is available, the body must be kept between the camera and the sun. Another point that will help to avoid waste, is to cultivate the habit of winding on the film immediately an exposure has been made.

British Railway Speeds Fifty Years Ago

The 1888 Race to Edinburgh

By Edward Bingley

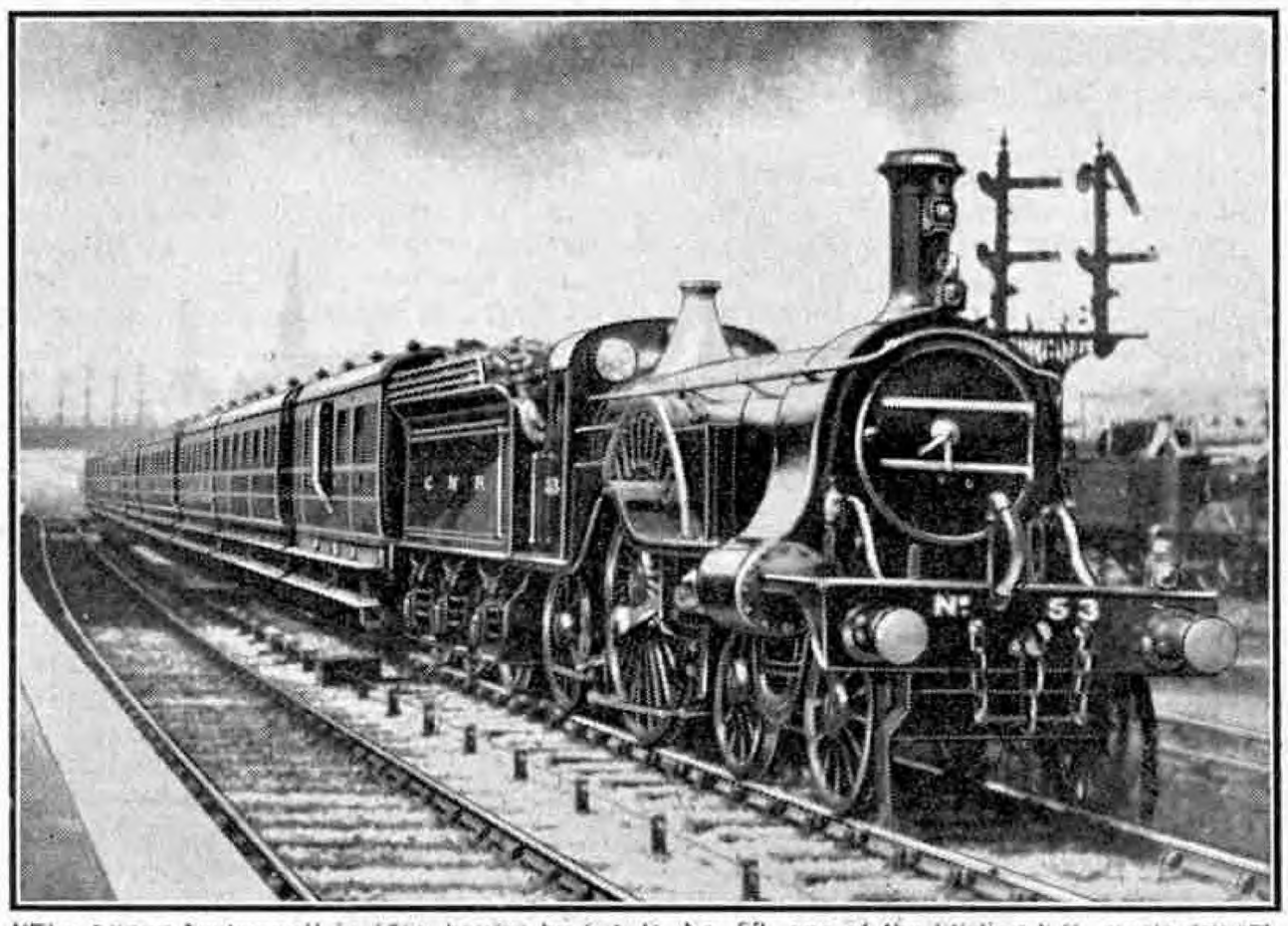
AN age of speed—how familiar the expression, yet how novel the idea! In these bustling days in which we live great speed of movement is a commonplace. Speed records are made only to be broken immediately afterwards, and the adventure of speed has lost much of its glamour. Speed begets speed, and often we are tempted to wonder what the end will be and whether finality will ever be reached. Yet it is only 50 years ago this month that the world was really startled for the first time at the possibilities of speed. It was done by two small British railway trains racing each other between London and Edinburgh in the summer of 1888. A small thing, indeed, yet its consequences have affected every one of us. The story is worth re-telling.

Since the inception of railways speed of travel had gradually been increasing. In 1837 the London-Edinburgh mail coach was taking 45½ hrs. for its journey, and our forebears thought this average of 9½ m.p.h. "perilously fast." By the eighties railway transport had settled down very comfortably after its first fine careless rapture, and at the beginning of 1888 there were two principal routes from London to Edinburgh, the East Coast from King's Cross, and the West Coast from Euston. Each route was a partnership of railway companies, the Great Northern, North Eastern and North British forming the East Coast alliance, and the London and North Western and Caledonian Companies providing the West Coast service. To-day these companies have lost their identities in the London and North Eastern and London, Midland and Scottish Railways respectively, but even 50 years ago there was a firm and well-established esprit de corps between the various partners in each competing route.

Then as now the East Coast Route was the more important for Edinburgh traffic from London, and its principal day train, *"The Flying Scotsman,"* now famous the world over, had been in regular daily service for 26 years, having commenced its career in June 1862. Since 1876 *"The Flying Scotsman,"* which was reserved for first and second class passengers only, had run the London-Edinburgh daily journey with great regularity in 9 hrs. at a steady 44 m.p.h. including stops. But more democratic days were at hand, and even the aristocrat of railway trains could not for ever remain unavailable for third-class passengers. In 1887 therefore third-class passengers were admitted to *"The Flying Scotsman."*

On the West Coast Route third-class passengers had for some years been permitted to ride in the principal day train to Edinburgh, but this was a much slower journey than by the East Coast Route, taking 10 hrs. to reach the Scottish capital. So the West Coast authorities, not perhaps without good reason, regarded the action of their East Coast rivals in admitting third-class passengers to *"The Flying Scotsman"* as something of a challenge. And that was really how it all began.

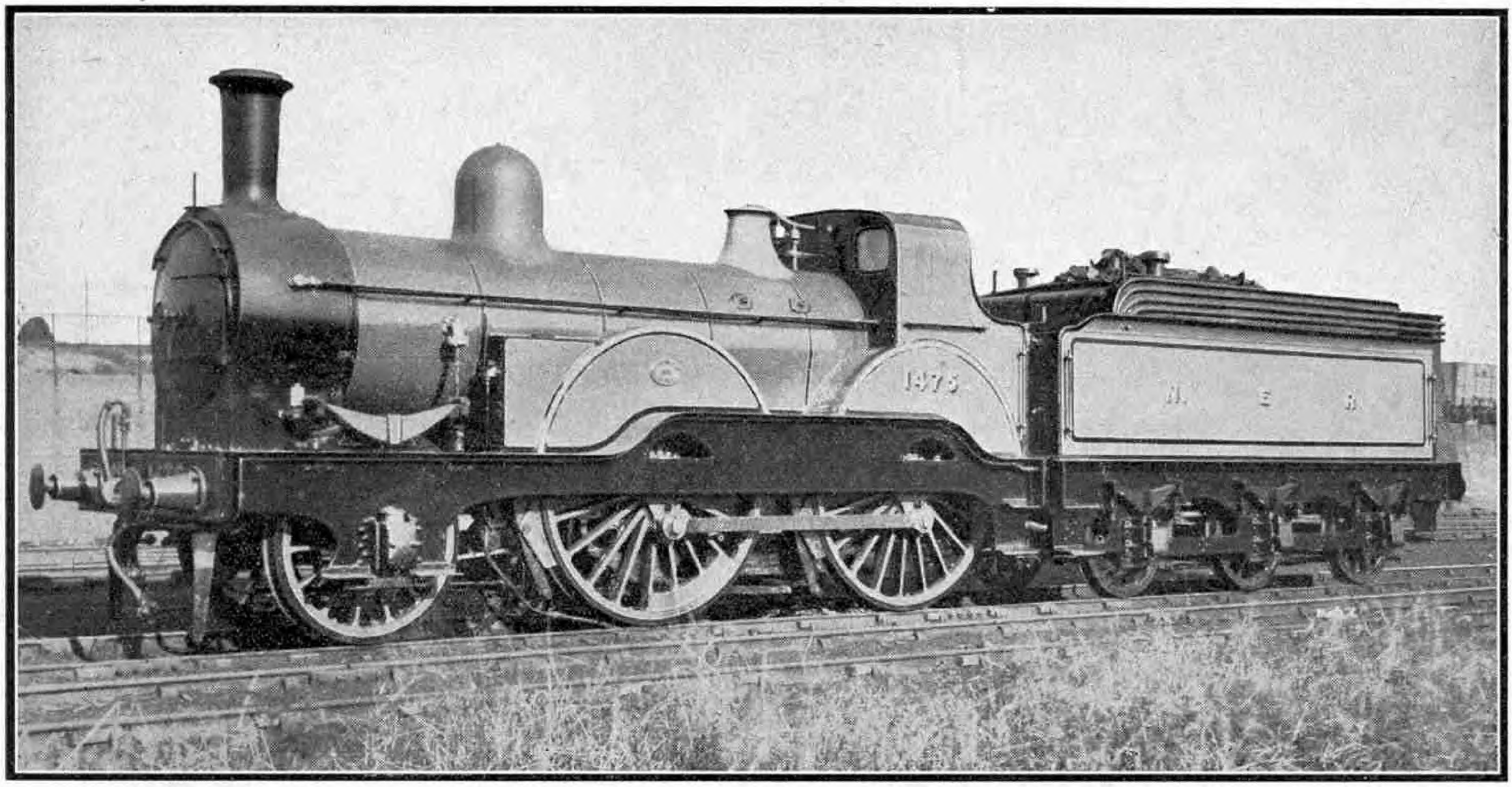
On 1st June 1888, as a reply to the East Coast challenge, the West Coast companies accelerated their train to run to Edinburgh in 9 hrs.; the East Coast partners, no less game, responded by accelerating *"The Flying Scotsman"* to 8½ hrs. as from 1st July. Towards the end of that month the West Coast authorities gave notice that they also would run in 8½ hrs., but as it happened the Great Northern and North Eastern Boards were meeting at King's Cross and York on the day that this announcement was made. Telegraphic communication was at once established between them, with the result that the East Coast partners made arrangements to do the journey in 8 hrs. on the very day that the West Coast were proposing to do it in 8½! This took the latter by surprise, but they immediately countered by announcing a further reduction to 8 hrs. to commence on 6th August. On this day their train arrived in Edinburgh eight minutes before time with a load of 80 tons, whilst the East Coast *"Flying Scotsman"* arrived on time with a load of 100 tons.



"The Flying Scotsman" in 1888 hauled by G.N.R. No. 53, one of the Stirling 8 ft. single-drivers. This and the upper illustration on the opposite page are by courtesy of the L.N.E.R.

At this stage public excitement became very intense. The newspapers were giving considerable attention to this "Railway Derby," for in those more spacious times international politics loomed far less large than they do to-day, and anyhow this was the world's baptism of speed. Credit must be given to the newspapers for their realisation that the Railway Race to Edinburgh represented far more than the rivalry of two competing industrial groups. It was in fact the birth of a new era.

As excitement became more widespread, so did the racing become more vigorous. On 13th August *"The Flying Scotsman"* was re-scheduled to reach Edinburgh in 7 hr. 45 min., but the West Coast train accomplished the journey in 7 hr. 38 min. The next day *"The Flying Scotsman"* was there in 7 hr. 32 min.,

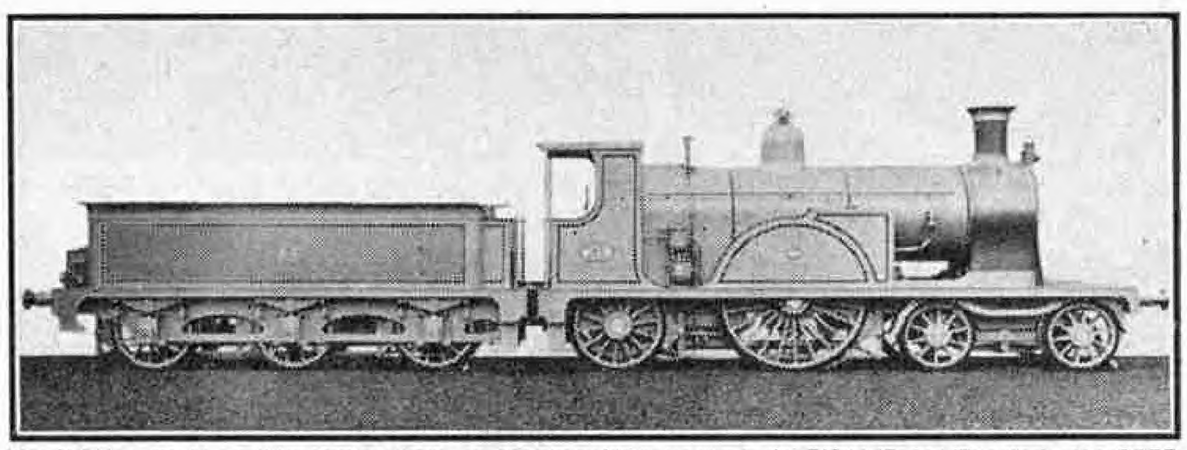


N.E.R. No. 1475 of the class often referred to as the "Tennants." They were introduced during a short period when a committee under the General Manager, Henry Tennant, supervised locomotive matters. In the 1888 Race to Edinburgh No. 1475 made the fastest run between York and Newcastle, 80½ miles in 78 min.

the run of 124½ miles from Newcastle to Edinburgh having been accomplished in 124 min., a marvellous achievement in those times, though the streamlined *"Coronation"* of to-day with more than three times the load thinks nothing of doing it in 120 min. every day!

But that great run finished the racing—officially at any rate. A conference was held between the rival authorities at which it was agreed that the booked times should be fixed at 7¾ hrs. for the East Coast line, and 8 hrs. for the West Coast, thus establishing the superiority to Edinburgh of the East Coast Route which it has held ever since.

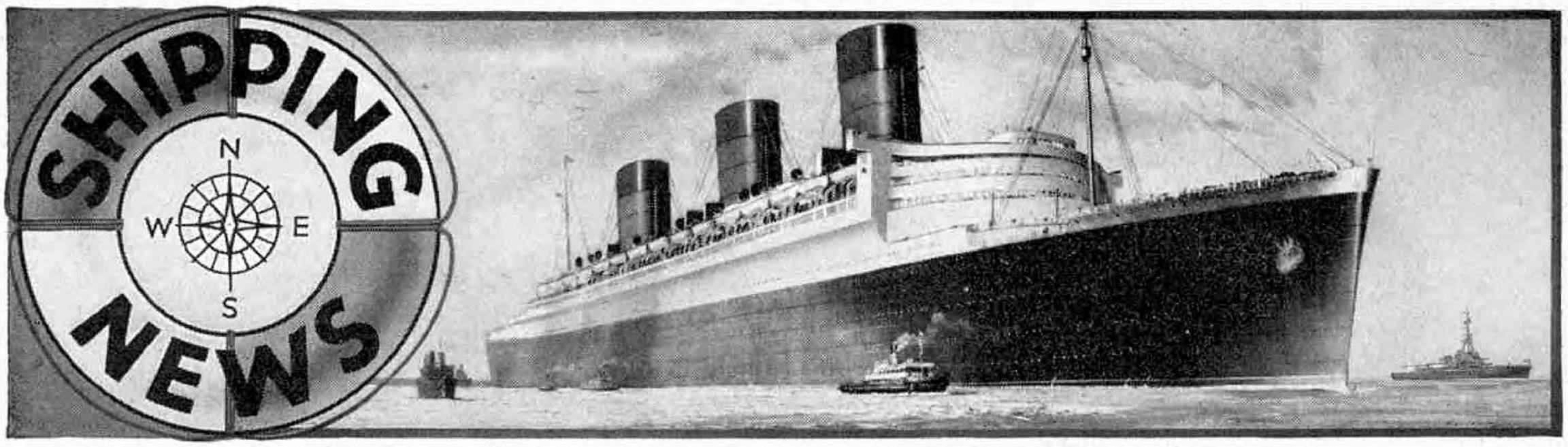
Unofficially, however, the racing was not quite at an end, for on the last day of the month the British sporting spirit asserted itself in the East Coast drivers who, turning a blind eye to officialdom, made a special effort to eclipse their previous performances, and brought *"The Flying Scotsman"* to rest in Edinburgh at 5.26¾ p.m.—7 hr. 26¾ min. after leaving London and 5¼ min. earlier than its previous record time. During this run it was reported that four consecutive miles had been covered at 76.6 m.p.h. This was speed with a vengeance, although of course the train only weighed 100½ tons, or one-fifth of the load of *"The Flying Scotsman"* to-day. The locomotives too, by modern standards, were very small. Between London and York, Patrick Stirling's 8 ft. single-drivers made the running; between York and Newcastle Tennant's "express passenger engines" were in charge of the train; and between Newcastle and Edinburgh one of the newest North Eastern Worsdell compound engines, then considered the latest thing in locomotives, set the pace. The drivers responsible were from King's Cross, Grantham, York and Newcastle, and their successors at these depots still perform some of the finest locomotive work in the world to-day.



Caledonian Railway No. 123, which played a notable part on the West Coast Route in the 1888 Race to Edinburgh. Photograph by courtesy of the North British Locomotive Co. Ltd., Glasgow, incorporating James Neilson and Co., the builders of the engine.

On the West Coast route the Caledonian partner may be considered to have performed the most striking locomotive work. Throughout the period of racing only one engine was used, No. 123, a 4–2–2 single-driver. It was the only one of its kind on the line, and had been shown at the Edinburgh exhibition of 1886, when it presented the appearance shown in the lower illustration on this page. With a load of four coaches it covered the 100¾ miles from Carlisle to Edinburgh in a daily average time of 107¾ min. The best performance was on 9th August, when the remarkable time of 102 min. 33 sec. was achieved. As a general rule on the L.N.W.R. the diminutive 2–2–2 single-drivers of the "Problem" class were employed between Euston and Crewe, while for the more difficult stretch from Crewe to Carlisle, including the climb to Shap Summit, four-coupled engines of the "Precedent" class were in charge.

In the first half century of railway development progress in regard to speed was slow; for the 9½ m.p.h. of the mail coach on the turnpike road there was substituted a speed of some 40 m.p.h. on the railway. During the 50 years that have elapsed since that memorable summer of 1888 great strides have been made. It is barely a month since the L.N.E.R. *"Coronation"* streamlined express train set up a new British record by attaining a speed of 125 m.p.h., and prior to reaching this maximum, 120 m.p.h. had been sustained for approximately three miles. Truly one wonders what speed marvels the chroniclers of 1988 may have to record!



On the Life-Boat Service

During the exceptional gales experienced on 1st and 2nd June 19 life-boats were launched on service, mainly on the south-east and south coasts, and 27 lives were saved. Special awards for gallantry were afterwards made to the life-boat crews at Southend, Hastings and Falmouth.

The motor life-boat at Hastings was out for five hours in very heavy weather on the night of 1st June, helping fishing boats caught at sea by the sudden gale. The coxswain himself was at sea in one of the fishing boats, and the second coxswain took command. After the life-boat had escorted in four fishing boats she went out again to the help of a fifth.

Thanks inscribed on vellum have been sent to Coxswain Page, of Southend-on-Sea, together with a framed letter of thanks and special money award for each of the eight members of his crew. The motor life-boat of which Coxswain Page has charge went out three times on 2nd June, in a full gale with a very heavy sea, and rescued two men from the yacht *"Wimpie,"* three men from the barge *"Glenrosa,"* and finally two men and a dog from the barge *"Audrey."* The life-boat was out for over 10 hours, and the coxswain and two of the crew were injured by the fall of the topmast of one of the barges.

The President of Latvia has awarded a decoration to Coxswain P. McPhee of the Port Askaig, Argyllshire, motor life-boat for the rescue of four men from the Latvian steamer *"Helena Faulbaums,"* wrecked in a gale in the Jura Sound. The coxswain was ill in bed when the call came, but got up against his doctor's orders, took command of the life-boat and was out with her for 17 hours.

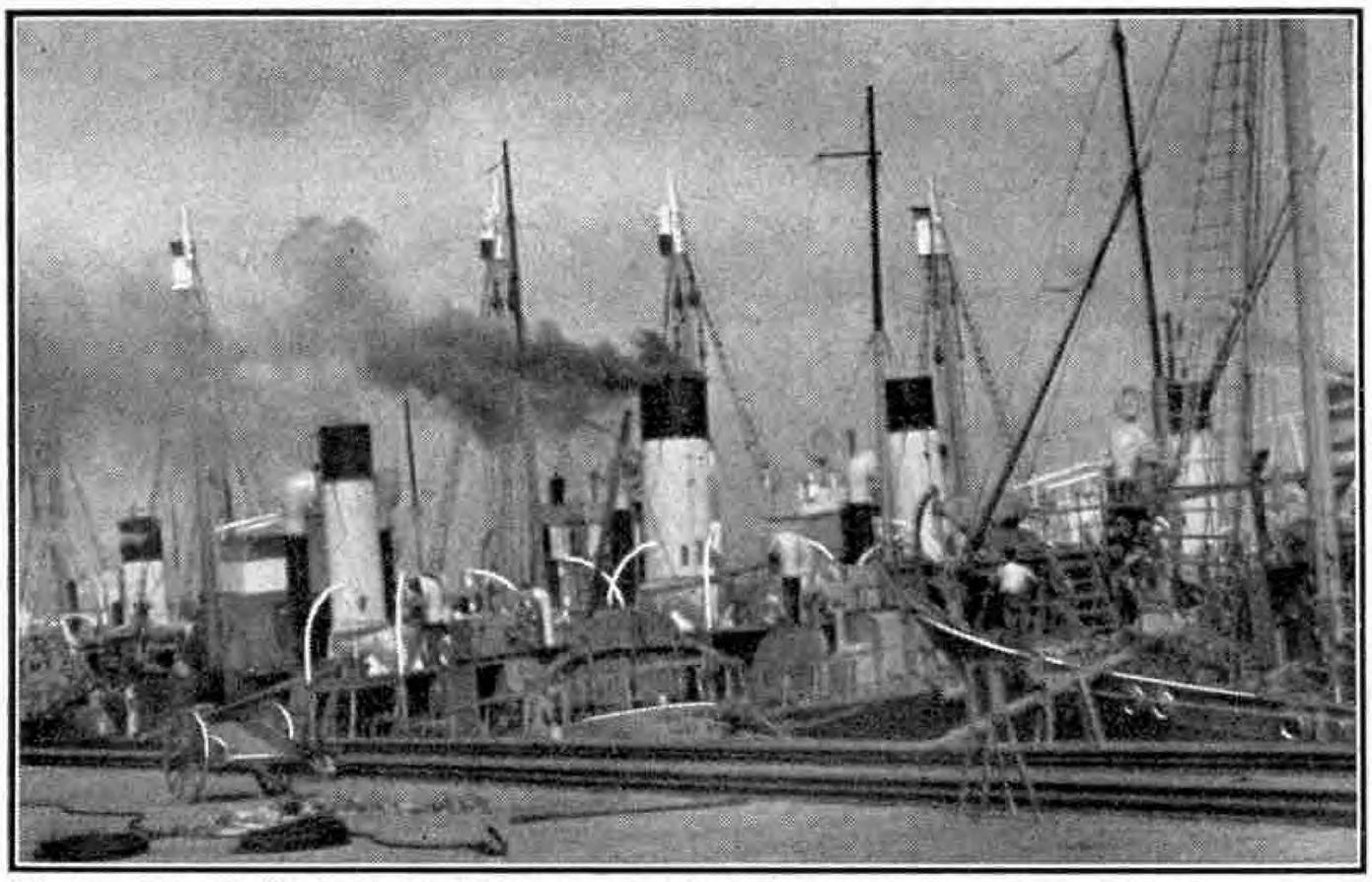
Sir Malcolm Campbell's Motor Yacht

Sir Malcolm Campbell recently took over a new twin screw motor yacht named *"Bluebird,"* which he has had built by the Goole Shipbuilding and Repairing Company Ltd. The yacht has a length of 95 ft. between perpendiculars, and is propelled by two five-cylinder oil engines, developing 150 b.h.p. at 600 r.p.m. and giving a speed of about 11 knots.

The World's Oldest Shipbuilders

The oldest shipbuilding concern in the world is Scotts' Shipping and Engineering Co. Ltd., of Greenock, established in the 18th century. It is just 100 years ago since the company received their first contract from the British Admiralty, this being for propelling machinery for two wooden warships, the *"Hecate"* and *"Hecla."* Scotts' Company built their first screw-propelled vessel for the Admiralty about the middle of the 19th century, and since then they have turned out a great number of warships of different types.

At the present moment in the Greenock shipyard and engineering works there are on hand 12 Admiralty contracts, 10 for ships and engines, and two for propulsion machinery to be installed in cruisers under construction elsewhere.



Whale catchers at Durban, South Africa, preparing for their long trip to the South Antarctic, where the hunting season commences about October. Photograph by J. Cowen, Durban.

"Aquitania's" Fastest Atlantic Crossing

The performance of the 45,647-ton Cunard White Star liner *"Aquitania"* on a recent round voyage between Southampton and New York speaks well for the efficiency of her propelling machinery and the strength of her hull. On the outward trip the 24-year old ship maintained an average speed of 24.41 knots, to beat her previous best. Homewards she covered 590 miles in 23 hours, equalling her record for a day's steaming on the east-bound run. This run is made in the opposite direction to that of the Sun across the sky, and the day is shorter by an hour.

Notable Merchant Ship Launches

The launch took place in May at the shipyard of Alexander Stephen and Sons Ltd. of the P. and O. steamship *"Canton,"* and she is now being fitted out. This vessel has the distinction of being the largest to be launched on the Clyde since the *"Queen Mary,"* and of vessels now under construction there she is second in size only to the *"Queen Elizabeth,"* which will be launched in September. The *"Canton"* will be of 15,700 tons gross, and will have a speed of 20 knots.

The launch also took place early this summer of the new motor liner *"Stockholm,"* built in Italy for the Swedish American Line. The vessel is 625 ft. long and has a gross tonnage of 28,000. The propulsion machinery consists of three single-acting, two-stroke, 10-cylinder engines of 22,000 i.h.p., which give a service speed of 19 knots. The *"Stockholm"* will operate on the North Atlantic route, and will be capable of carrying 1,350 passengers, with a crew of about 600. She will also make cruises, when accommodation will be limited to 620.

New Russian Floating Dock

Tests were recently carried out on a 4,000-ton floating dock built by Swan, Hunter and Wigham Richardson Ltd. at their Wallsend shipyard for the Government of the U.S.S.R. The dock was then taken in tow by three Soviet tugs, which are taking it to Murmansk. It is built in two sections, and contains seven pontoons, four in the larger section and three in the smaller. It has a length of over 396 ft. and a breadth of 86 ft., with a clear inside width of 66 ft.

British Motor Boat Records

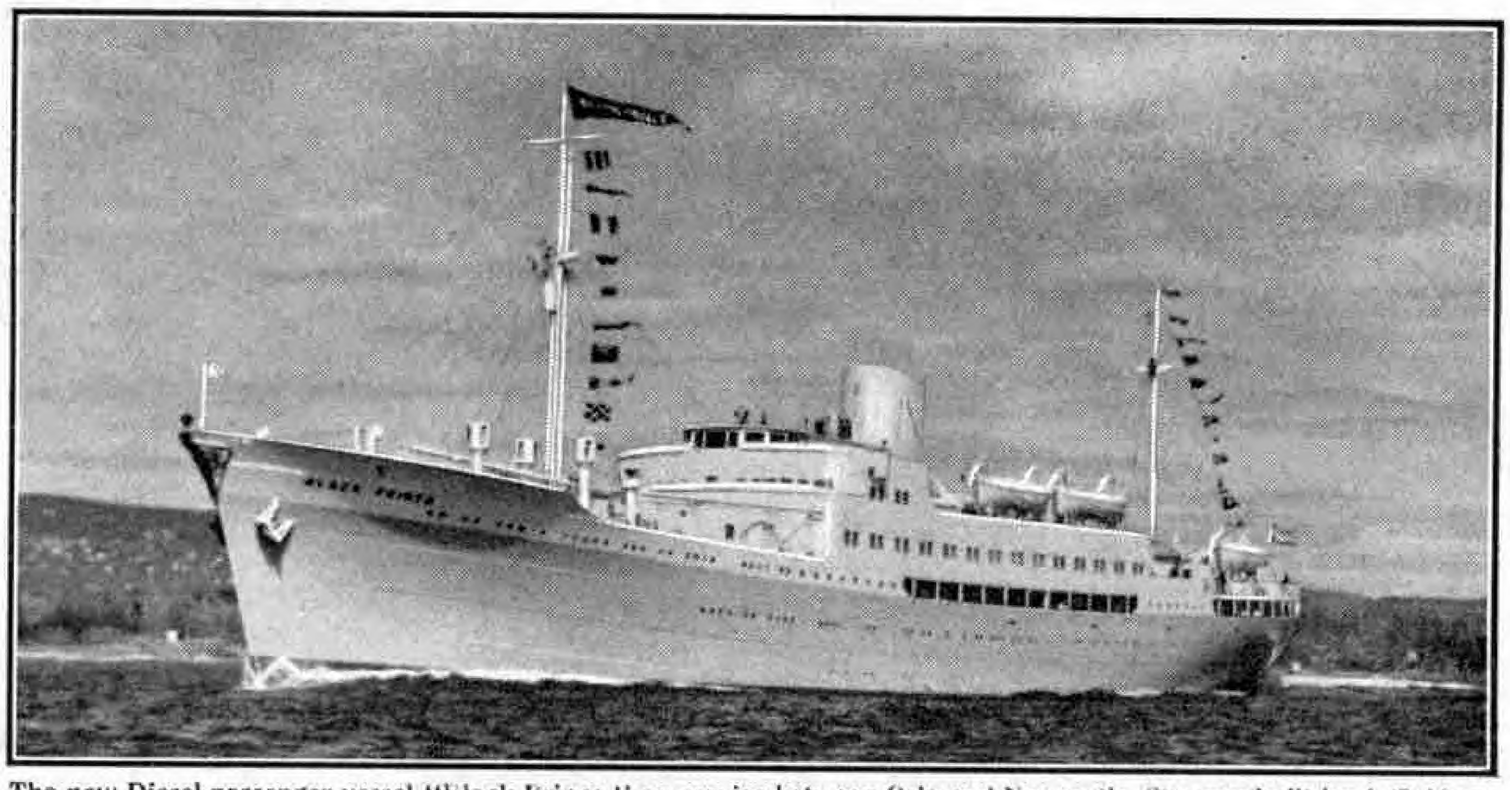
Mr. H. C. Notley, the well-known motor boat enthusiast, established two 4-litre class motor boat national records in June in Poole Harbour with an 18 ft. hydroplane, fitted with a Lycoming engine of 175 h.p. He averaged 67.40 m.p.h. in four runs over the measured mile, and eventually covered 24 miles at an average of 54.76 m.p.h. The first speed easily beat the previous national record of 60.78 m.p.h., while no 24-mile record has previously been established in this class.

Diesel Ship for North Sea Passenger Service

An interesting motorship recently put into service is the Diesel-engined *"Black Prince,"* built by A/S Akers mek. Verksted, Oslo, and handed over in May to the owners, Fred Olson and Company. She is now operating on a passenger service between Oslo and Newcastle, and carries about 130 passengers in two classes.

The *"Black Prince,"* which is shown in the upper illustration on this page, has an overall length of 385 ft. 9 in., with a breadth of 53 ft. and a gross tonnage of 5,039. The hull has watertight and fireproof bulkheads and a double bottom in order to give the greatest possible margin of safety.

The vessel is driven by two single-acting 9-cylinder Diesel motors, with solid injection, which develop 7,000 i.h.p. at 145 r.p.m. The vessel has a figurehead in bronze, and a decoration on the counter incorporating the name of the ship on a ribbon carried by two seagulls, also in bronze.



The new Diesel passenger vessel "Black Prince," on service between Oslo and Newcastle. She was built by A/S Akers mek. Verksted, Oslo, to whom we are indebted for our illustration.

Work for the Shipbreakers

In the *"M.M."* for December 1936 appeared an article on the veteran steamship *"Edina,"* owned by Howard Smith Ltd., of Melbourne, and believed to be the oldest ship in service in the southern hemisphere. This grand old vessel was recently retired, with a view to its being broken up.

The *"Edina"* is a barquentine-rigged iron screw steamer of 380 tons gross, and she was built 84 years ago by Barclay, Curle and Co. Ltd., of Glasgow. During her adventurous career she served as a trooper in the Crimean War and a blockade runner in the American Civil War, carried Australian prospectors to New Zealand gold fields, and had the distinction of leading the line of vessels that escorted the Duke of Edinburgh into Sydney Harbour in 1867. Since 1873 she has run regularly on the 80-mile round passenger service between Melbourne, Geelong and Portarlington.

Another interesting vessel being broken up at the Thames yard of Thomas W. Ward Ltd. is the motorship *"Dan,"* which was the first ocean-going twin screw ship built on the Clyde to be propelled by Diesel engines. For nearly 25 years the vessel was known as the *"Jutlandia"* and was in the service of the East Asiatic Company of Denmark, passing last year to Norwegian owners, who recently sold her for breaking up. The vessel had a length of 370 ft. between perpendiculars and a beam of 53 ft., and was of 5,300 tons gross. Like her sister ships, the *"Selandia"* and *"Fiona,"* built and engined in Denmark, the *"Jutlandia"* was without funnels, the exhaust from her engines being discharged through her mizzen-mast.

A Stormy Summer

The unusually stormy summer caused life-boatmen to be busier in May and June than in the same two months of any previous year since the National Life-boat Institute began to keep records. In May there were 34 launches of life-boats to vessels in distress, and 35 in June, and more than 60 lives were saved during the two months.

In the first six months of the present year there were 214 launches, and 297 lives were rescued. Life-boats saved or helped 148 boats and vessels, and the Royal National Life-boat Institution rewards for services, compensation for injuries, and payments to dependents of life-boatmen who have lost their lives in the service amounted to £5,432.

* * * *

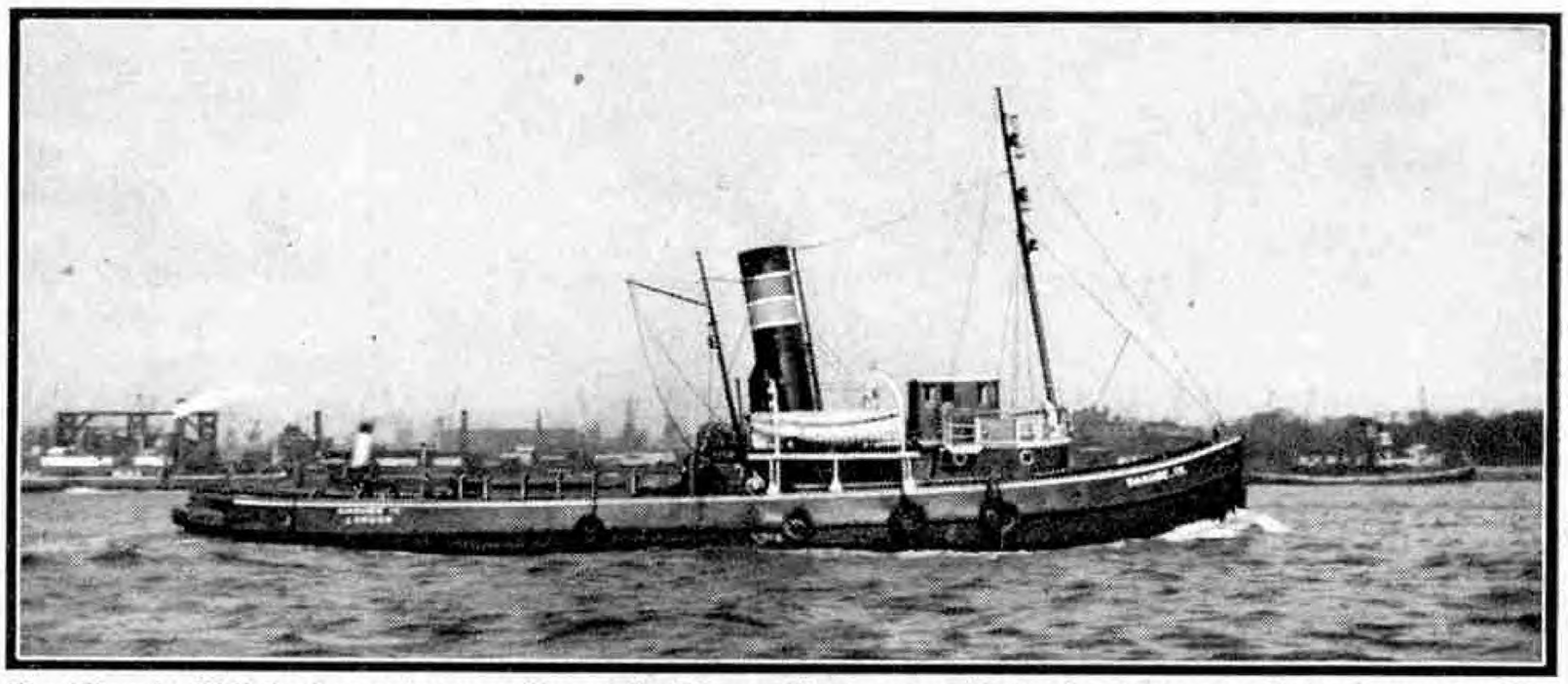
John I. Thornycroft and Co. Ltd. recently handed over a motor minesweeper ordered by the British Admiralty. The vessel has a length of 75 ft., and three 500 h.p. 12-cylinder petrol engines are installed. The maximum speed is 17 knots, or 10 knots when the vessel is loaded with minesweeping gear.

The Largest Tug on the Thames

The lower illustration on this page shows the steam tug *"Danube IV,"* the largest tug in service on the Thames. She was built at Aberdeen in 1927, and has a length of 110 ft. 4 in., a beam of 27 ft. 6 in. and a registered tonnage of 239. Her funnel is black, with red and yellow bands edged with white.

The *"Danube IV"* is engaged in towing dredgers to various parts of the river and docks. The silt drawn up from the river bed is deposited in dumb or motorless hopper barges, and the *"Danube IV"* is then responsible for towing these to sea, where the silt can be dumped. The tug and hoppers leave for the sea on the ebb tide, and on arrival at the "Deposit Grounds" just past the Hore Light, the silt is released through trap doors. These are opened by chains suspended from the "strong back" of the vessel, which is a bridge spanning the hopper from stem to stern along the centre line. When the hoppers are empty the trap doors are shut, and the vessels return on the flood tide. The round trip takes about 12 hours.

W. P. Conolly.



The "Danube IV," the largest tug operating on the Thames. She is engaged in towing dredgers to the various parts of the river and docks where work awaits them. Photograph by W. P. Conolly, Battersea.

With the Salvage Crews

Metal Industries Ltd., Rosyth, who have continued the work of salvaging the sunken German warships at Scapa Flow in succession to Cox and Danks Ltd., are at present engaged in raising the battle cruiser *"Derfflinger,"* a 36,700-ton warship lying upside down in about 25 fathoms of water, with a list of some 20 deg.

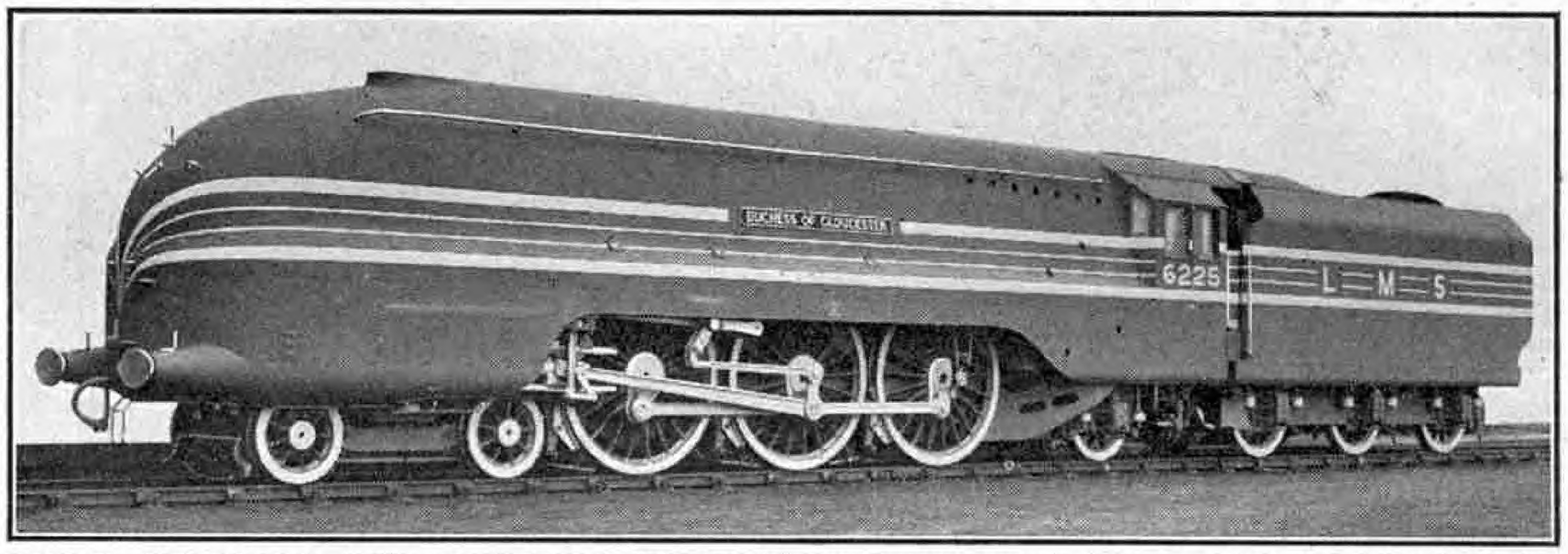
Another interesting salvage task recently undertaken was that of the wreck of H.M.S. *"Lutine,"* which sank in a gale off the entrance to the Zuider Zee in October 1799, with £2,000,000 in gold on board. Up to the present time bullion worth about £100,000 has been recovered in various salvage attempts. The task is now being attempted by the Billiton Joint Mining Company, of The Hague, and work was commenced in June with the company's new dredger *"Karimata,"* the buckets of which can reach a depth of 100 ft., and are thought to be sufficiently strong to dig out and lift any remaining wreckage. The *"Karimata"* is 250 ft. in length, and has been built for dredging tin in the Dutch East Indies.

The bell of the *"Lutine"* was recovered in 1859, and now hangs in the rostrum of the Underwriting Room at Lloyds, London.

The Development of the 4-6-2 on the L.M.S.

The New "Duchess" Locomotives

WITH the building at Crewe of ten new 4–6–2 express locomotives this year the "Pacific" wheel arrangement has reached a further stage of development on the L.M.S. The intention to construct these engines was announced in the *"M.M."* some months ago, and in the July issue of this year the appearance of the first of them No. 6225 *"Duchess of Gloucester"* was recorded. She and her sisters Nos. 6226-29 are streamlined; now No. 6230 *"Duchess of Buccleuch"* has been completed, and with Nos. 6231-34 is a non-streamlined version of the same design.



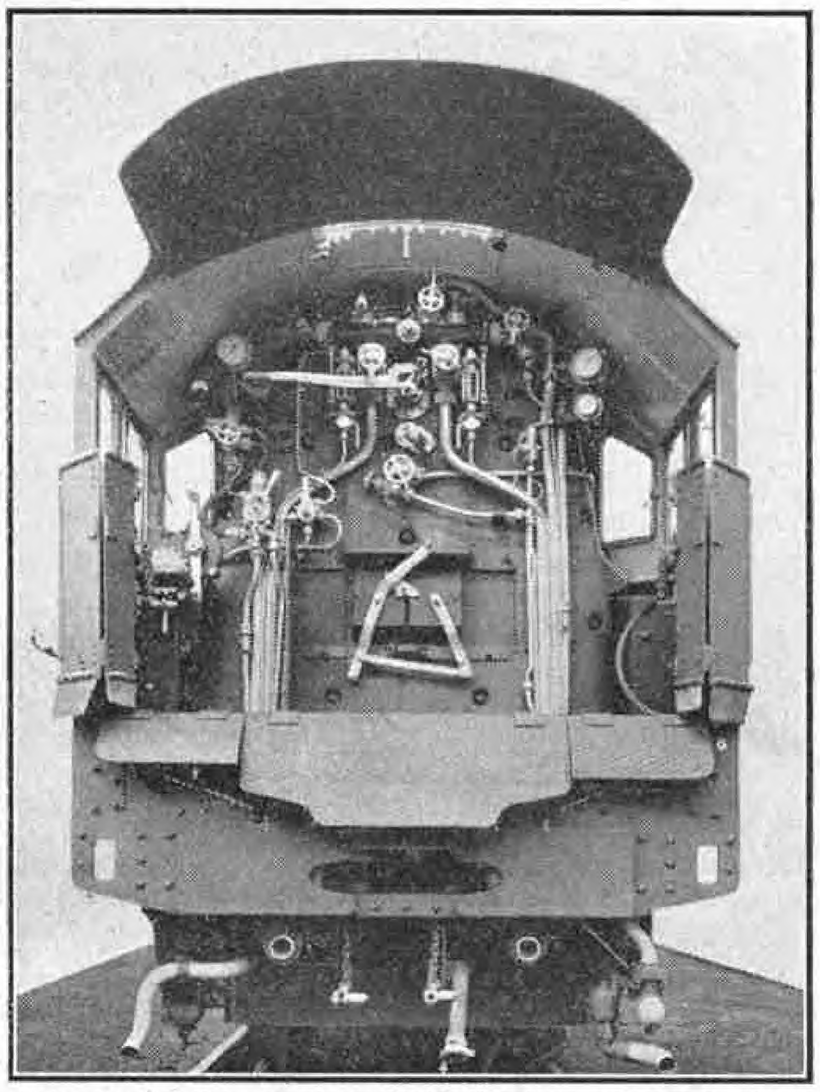
L.M.S. No. 6225 "Duchess of Gloucester," the first of the five streamlined engines developed from the "Princess Coronation" class to make her appearance. She is finished in standard L.M.S. red, with gold bands running from front to rear.

This is an interesting point, for it will now be possible to compare directly for the first time on the L.M.S. the performance of two series of engines identical except in the matter of streamlining. In fact the only other engines in this country with which such a comparison is possible are the L.N.E.R. "Sandringhams"; two of these were specially streamlined for the "East Anglian" service, the others being of standard external appearance. The L.N.E.R. "A4" class of 4–6–2s have no non-streamlined variation; so that as far as heavy long-distance work is concerned in Great Britain these new L.M.S. engines are the only ones where a direct comparison of performance is afforded.

In all the essentials of locomotive design the ten "Duchesses" do not differ greatly from the five pioneer L.M.S. streamliners of the "Princess Coronation" class introduced last year specially for service on *"The Coronation Scot."* The 6 ft. 9 in. driving wheel diameter of these engines is retained for the new "Duchesses"; whereas their predecessors, the famous "Princesses," have driving wheels 6 ft. 6 in. in diameter. It will be interesting to see how the new engines with the larger wheels acquit themselves in heavy general service as compared with the "Princesses."

The four companions of the streamlined *"Duchess of Gloucester"* are named *"Duchess of Norfolk," "Duchess of Devonshire," "Duchess of Rutland"* and *"Duchess of Hamilton,"* and are numbered 6226 to 6229 in order. The non-streamlined engines are *"Duchess of Atholl," "Duchess of Montrose," "Duchess of Sutherland"* and *"Duchess of Abercorn"* numbered respectively 6231 to 6234, in addition to the *"Duchess of Buccleuch"* already mentioned.

All these engines have four cylinders, with a diameter of 16½ in. and a stroke of 28 in. The boiler pressure is 250 lb. per sq. in., and the tractive effort is 40,000 lb.

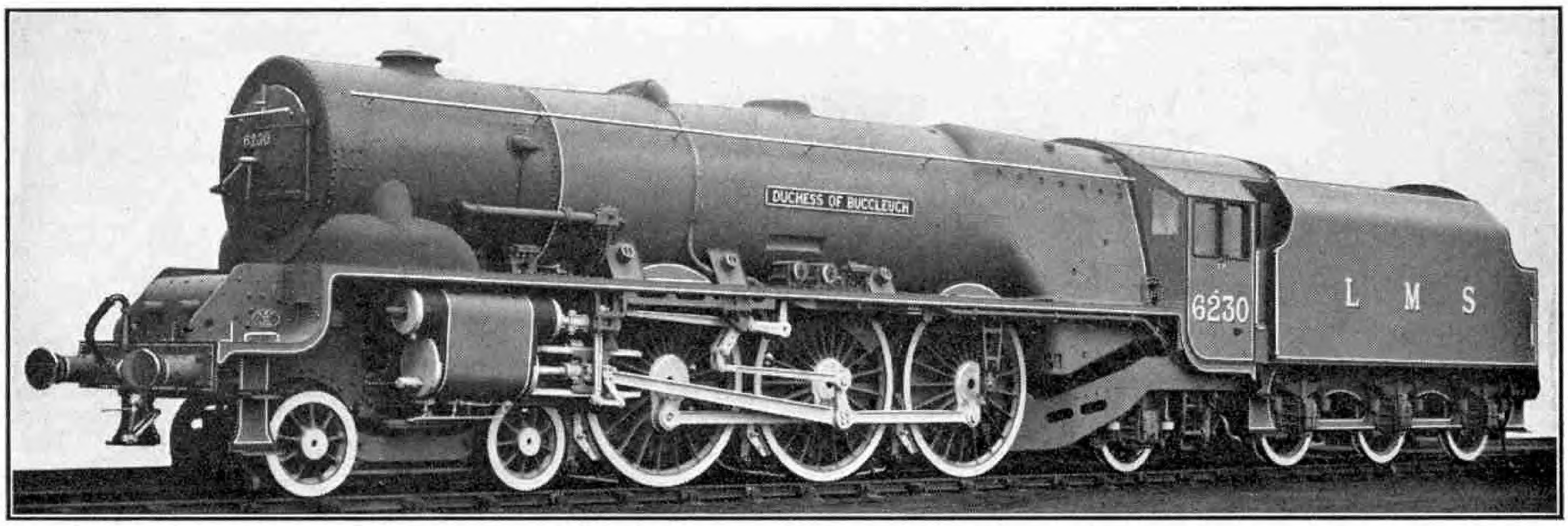


Cab view of the non-streamlined "Duchess of Buccleuch."

The *"Duchess of Buccleuch"* and her non-streamlined sisters are distinguished by bulbous casings at the front end alongside the smoke-box on each side. These can be seen in the illustrations of this locomotive on the opposite page. They form coverings for the steam pipes, each of which branches in two directions. A further distinguishing feature is that the front of the cab in these engines is prow-shaped, the projection enclosing the pop safety valves.

An interesting point in connection with the *"Duchess of Abercorn,"* the last of the non-streamlined "Duchesses," is that a hopper ashpan and dropping grate suitable for test purposes is being fitted. With these the quantity of ash and the amount of fire remaining in the fire-box can be measured at the end of a run in order to allow exact figures of coal consumption to be obtained.

What the "Duchesses" are capable of was shown on 8th June when a special train carrying members of the Institution of Locomotive Engineers, together with German visitors, was hauled from Euston to Glasgow by the streamlined *"Duchess of Gloucester."* The train consisted of seven vehicles, including a dynamometer car, so that the train load was only 232 tons. The *"Duchess of Gloucester"* herself weighs in working order about 108 tons, inclusive of the 56-ton tender, and little demand was made on her capabilities. She showed her powers by a remarkably effortless performance, however, and it was clear that if necessary the 6 hr. 55 min. allowed for the journey, with one stop at Carlisle, could have been reduced to a very considerable extent. The 10-mile climb at Beattock was made at an average speed of 57.6 m.p.h., the summit being passed at 50 m.p.h.,



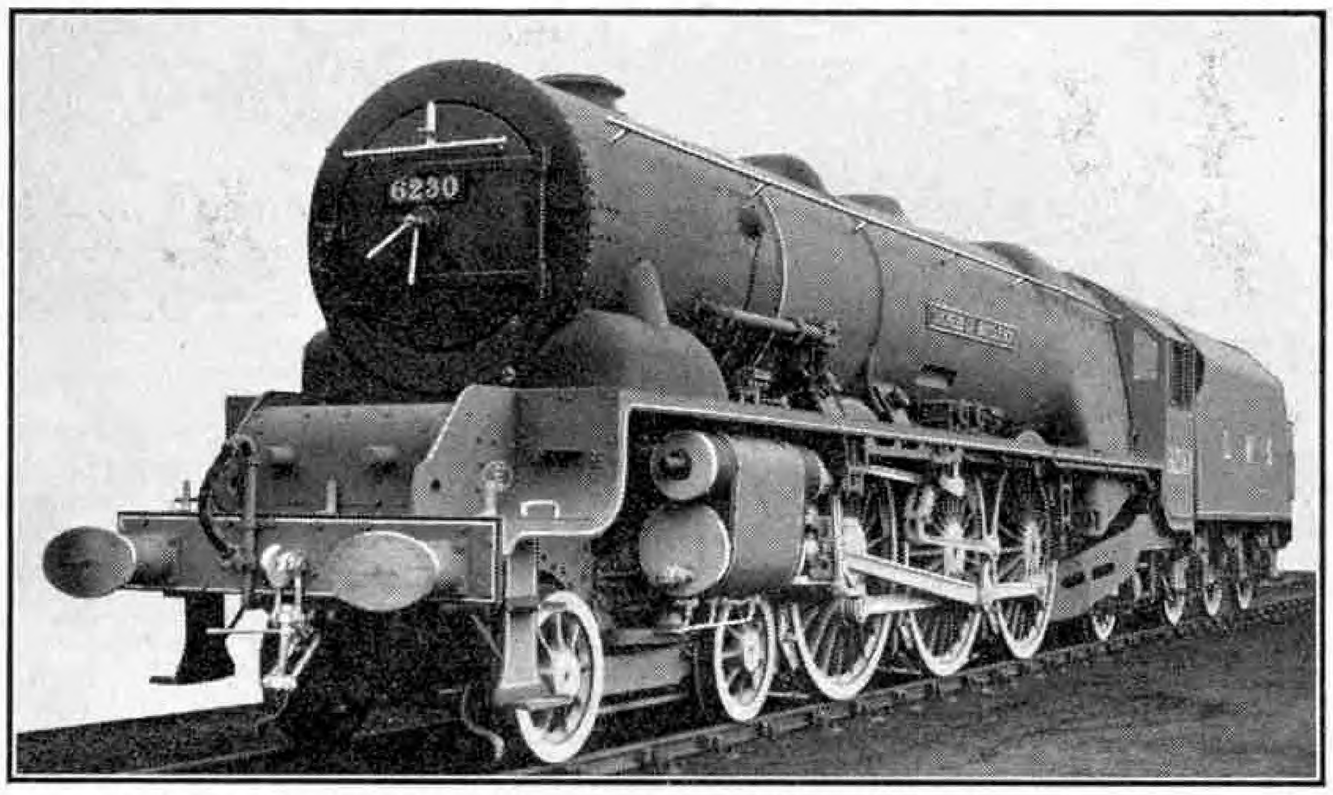
L.M.S. No. 6230 "Duchess of Buccleuch." This locomotive is the first of the five non-streamlined engines included in the ten 4-6-2s being built at Crewe to the designs of Mr. W. A. Stanier, Chief Mechanical Engineer. The tractive effort of these engines is 40,000 lb., and the driving wheels are 6 ft. 9 in. in diameter.

and the maximum speed during the run was approximately 90 m.p.h. and the coal consumption was 28.2 lb. per mile, a very moderate figure.

The new "Duchess" 4–6–2s come of a noble line of locomotives, and it is of interest to trace their lineage. Their immediate forerunners were the smart blue-and-silver finished streamlined "Princess Coronation" class built just over 12 months ago, which have put up such consistent running with *"The Coronation Scot."* Apart from their special finish these possessed the novelty of being the first L.M.S. engines to be streamlined.

Their advent too had a personal connection with the *"M.M.,"* for the Editor was one of the privileged circle who were present when the first of them, No. 6220 *"Coronation,"* emerged from the shops at Crewe. This engine was destined very soon to become a record-breaker. Within a few weeks, on a special run between Euston and Crewe of a train made up of eight of the nine vehicles composing a standard *"Coronation Scot"* formation No. 6220, with that wizard of L.M.S. enginemen Driver Tom Clarke of Crewe in charge, reached a speed of 114 m.p.h. in descending the incline into Crewe from the south. At that time this was the highest railway speed ever recorded in this country. Not content with that, Driver Clarke worked the train back to Euston at the amazing average speed of 80 m.p.h.!

Although nothing so spectacular has been achieved by the "Princesses," the pioneer 4–6–2s of the L.M.S., the remarkable test runs between Euston and Glasgow made in November 1936 will be remembered by *"M.M."* readers. Hornby Train enthusiasts at least will scarcely need reminding that No. 6201 *"Princess Elizabeth,"* on that occasion also in the hands of Driver Clarke, made the up run non-stop with a load of 260 tons in 5 hr. 44 min. at an average of 70 m.p.h., a world record for long-distance steam travel. Apart from such "fireworks" as this, the "Princesses" have in ordinary service a splendid record of consistently brilliant work, as the *"Railway News"* pages of the *"M.M."* have so often borne witness.



Another view of the "Duchess of Buccleuch," showing the bulbous casings of the steam pipes.

As in performance, so in design and construction did the "Princess" 4–6–2s set up new standards on the L.M.S. They were the first L.M.S. standard engines to incorporate four-cylinder propulsion and the first L.M.S. express engines to have tapered boilers. In these features, as in the use of a high boiler pressure and in their front-end arrangements, they displayed characteristics bearing the stamp of Swindon, where their designer Mr. W. A. Stanier had spent his professional life before his appointment as Chief Mechanical Engineer of the L.M.S. The original moderate-degree superheaters and domeless boilers have been modified, but the elements of the "Princess" design are present in the "Princess Coronation" 4–6–2s and now in the "Duchesses." With such a backing the "Duchess" engines both streamlined and otherwise no doubt will do well.

Readers with an eye for locomotive detail will note various differences between the non-streamlined "Duchesses" and the "Princesses" apart from the cab front and the steam pipe casings previously mentioned. For instance, the curved nameplates fitted over the central splashers of the "Princesses" have given place to straight plates mounted on the boiler barrels of Nos. 6230-34, an interesting reversion to old-time practice.

With the streamlined classes, old and new, little difference is apparent except in finish. The blue paint and silver bands of the "Princess Coronation" engines are replaced by L.M.S. red with gold bands on Nos. 6225-29. The striking decorative scheme with the bands springing from a central point at the front end and continuing throughout the length of the engine and tender is retained. This feature helps to relieve the otherwise plain appearance of the sleek streamlined casing.

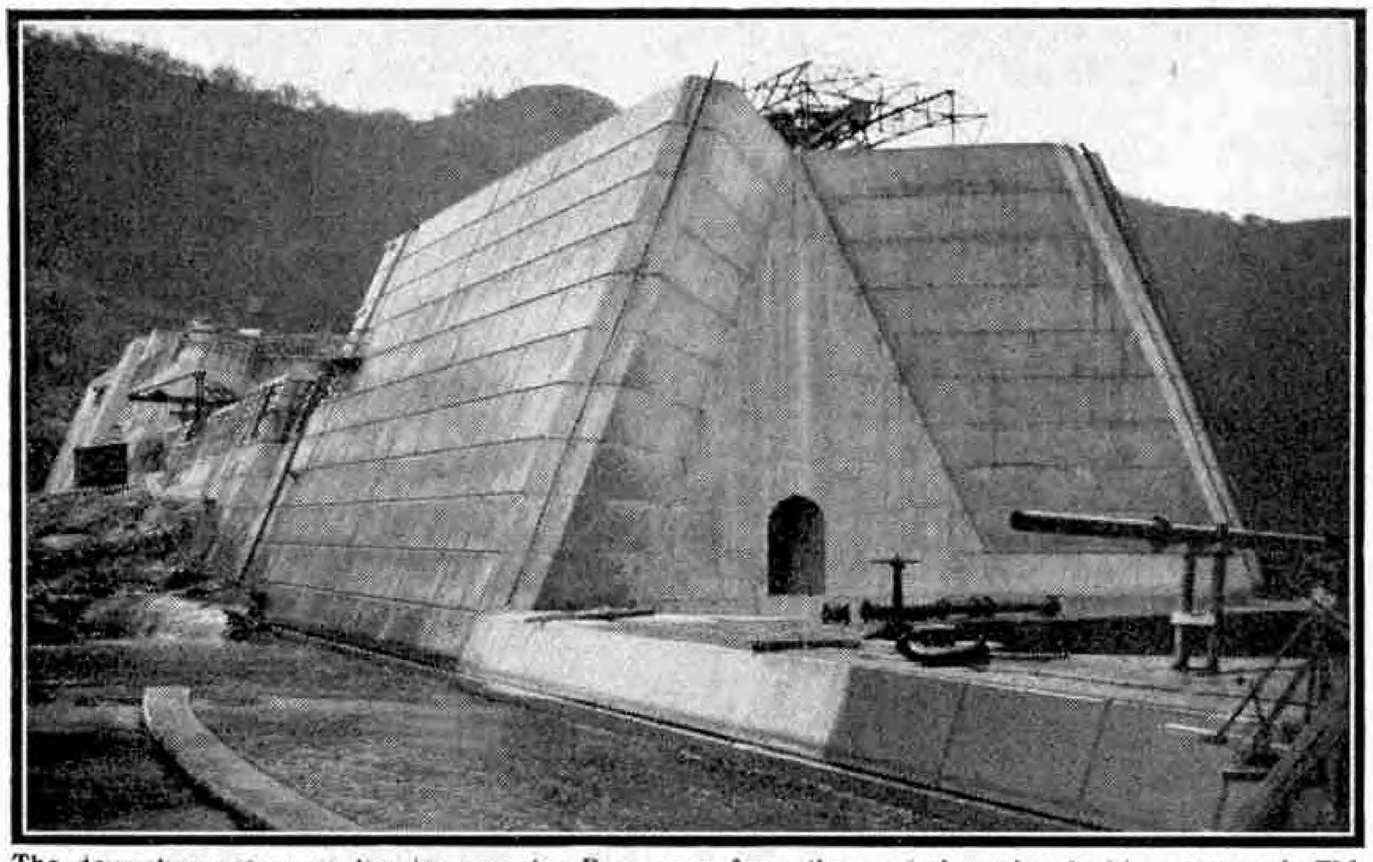
The Haweswater Dam

Huge Water Supply Scheme for Manchester

By O. S. Nock, B.Sc., A.M.I.Mech.E.

IN a wild vale among the Westmorland fells work is proceeding rapidly on one of the largest civil engineering projects seen in this country for some time—the Manchester Corporation waterworks scheme at Haweswater. By kindness of the Engineer, Mr. L. Holme Lewis, M.Inst.C.E., I was privileged to make an inspection of the works, which at the present time are at a very interesting stage. One could not wish for a more fascinating example of the romance of engineering achievement coupled with the romance of the wilds. I came to Haweswater, one of the least frequented of the English lakes, on a rough day in early April, when to the natural beauty of the setting was added the grandeur and fury of a mountain storm. With the wind roaring down the valley as through a funnel, clouds flying over the summits of High Street, and Harter Fell, and the lake a welter of tossing breakers, the works in the valley were a scene of great activity.

In a snug little office well up the hillside I was most cordially received by the Resident Engineer, Mr. W. H. M. Jameson, A.M.Inst.C.E. He first of all explained to me how this great undertaking, which will eventually cost ten-and-a-half million pounds, came to be necessary. Among the cities of Great Britain, Manchester ranks second only to London in the magnitude of its water supply service. The corporation supplies not only the needs of the city itself, but also, by arrangement a considerable number of other towns near by. The present average consumption is 60 million gallons a day, and this figure is increasing so steadily that before many years are past it is anticipated that the demand will exceed the supplies available at the corporation's two other resources, Longdendale, in the Derbyshire hills, and Thirlmere in the Lake District. To be ready for this eventuality the necessary Parliamentary sanction was obtained in 1919 to harness Haweswater, a source of supply vastly greater than either of the other two.



The downstream face of the Haweswater Dam seen from the central section looking eastward. This photograph shows the hollow interior of one of the sections and the passage through the dam.

The complete scheme embraces not merely Haweswater, but also a number of neighbouring dales, and although the present works concern only the lake, the provision made for future extensions is very interesting. Haweswater now has an area of 346 acres, and the first stage of the scheme involves raising the water level 95 ft., and so increasing the area to some 1,000 acres. The enlarged lake will extend for some distance to the south, and will have extremities in Mardale and Riggindale. This stage will increase enormously the volume of water impounded, and by raising the level will increase the hydraulic "head," which in turn will make easier the conveyance of the water to Manchester.

But although the natural storage capacity of Haweswater is thereby increased, the lake will remain a reservoir for the same area of country as at present. With a consumption of water such as is anticipated in the future, the normal rainfall over that area would not be sufficient to keep the enlarged lake full, and so the later stages of the scheme provide for diverting other waters into the lake.

Two further reservoirs are contemplated, one in Swindale, where there is no lake at present, and the second in Wet Sleddale, which bears away south-west from the L.M.S. main line at Shap Summit. These two artificial lakes will eventually be connected to Haweswater by a tunnel. Then the streams of two more valleys that run eastward from the High Street range, Helton Dale, and Caw Dale, will be turned southward into Haweswater, so that eventually the rainfall from 24,000 acres will be collected in the enlarged lake. This area, which is known as the "catchment area," will ensure a supply to Manchester of 72 million gallons of water per day.

The level of Haweswater is at present 695 ft. above the sea. The natural outlet is at the north end, and here a great dam is being constructed that will raise the level of the water 95 ft. The Manchester Corporation supply, however, will be tapped from the south end of the lake, where a tunnel 4⅞ miles long has already been driven under Gatesgarth Pass to the Long Sleddale valley. This tunnel is one of the longest in England. It was driven from both ends simultaneously, and the two parties met in the centre with the spectacular exactness of Alpine railway tunnelling. The actual cross section of the tunnel is curved at the top and bottom, having straight sides.

The aqueduct by which the water will be conveyed to Manchester is 73¼ miles long, and of this distance 30¾ miles will be in tunnel; of the rest there will be 8½ miles of covered channel and 34 miles of pipeline. But by far the most interesting part of the scheme, by reason of both its size and its novel design, is the Haweswater Dam; and from the window of his office looking out across the valley Mr. Jameson described the general layout.

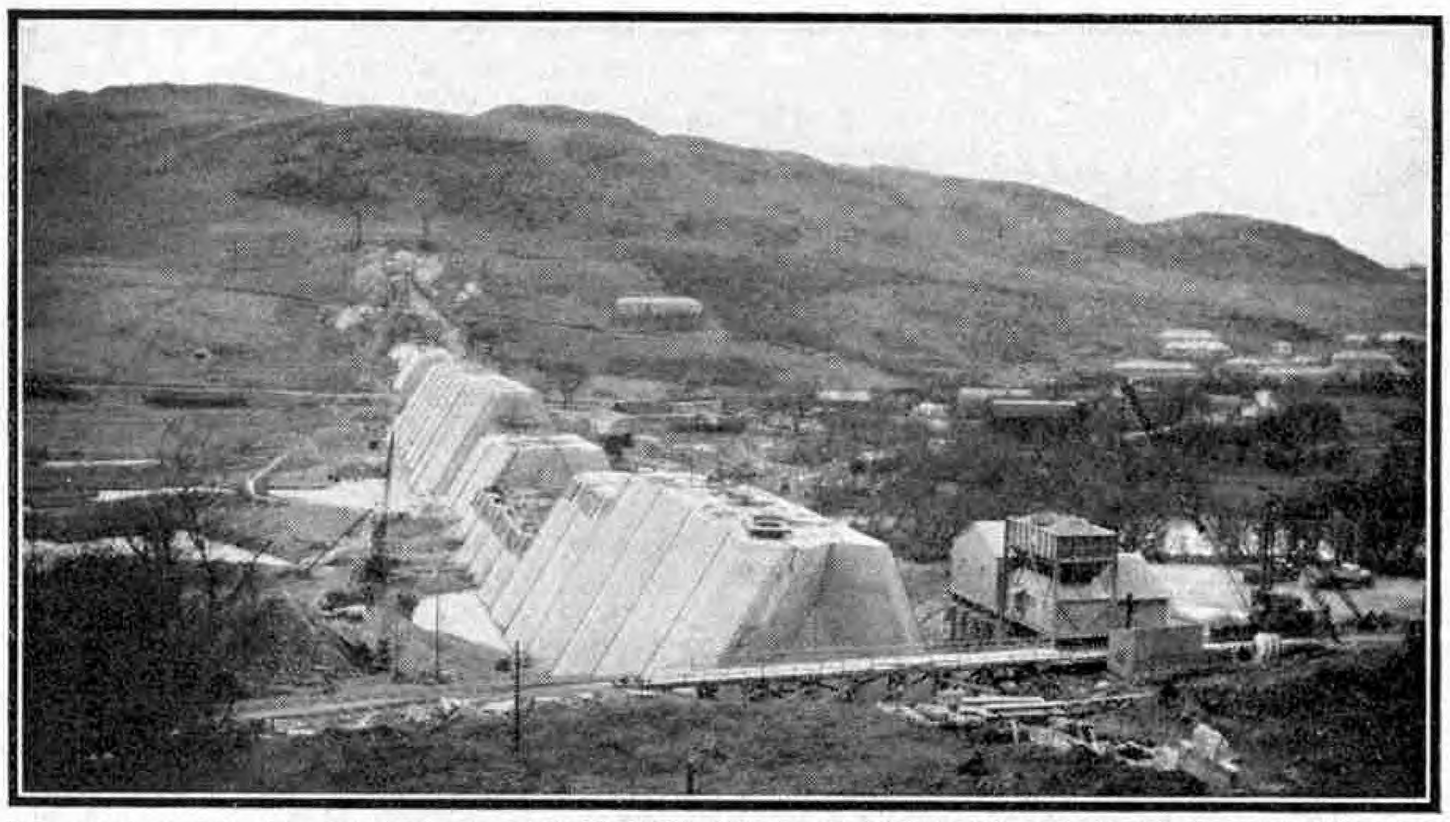
The dam is built entirely in concrete. Instead of having a flat sloping face on the upstream, or lake side, the face consists of a series of buttresses—a form of construction never previously employed. The use of concrete necessitates the building of the dam in sections, and each 35 ft. wide section includes one buttress. The buttress shape is highly effective in resisting the water pressure, but it also has allowed various sections to be built quite independently, and moreover without any joint in the concrete between adjoining sections. The downstream face of the dam will be a continuous sloping wall, and the complete formation from up to downstream side is not unlike the shape of a flat-bottomed rail.

Where the sections butt against one another the dam is kept watertight by the insertion from bottom to top of the dam of a strip of copper, which throughout its length is bent into the form of a letter T. The horizontal arms of the T are cast one into each of the adjoining sections, thus leaving the vertical stroke of the T on the line of the join. This ingenious form of construction provides for contraction of individual blocks, for if a slight gap should develop the special form of the copper strip causes it to act as a hinge, and watertightness is maintained. The line of abutment of adjoining sections is only 6 ft. long, and a second line of defence against the percolation of water is provided by a channel cast in the concrete that will be filled with bitumen.

Having explained the design thus far, Mr. Jameson then took me for a detailed look round the works. The gale was going stronger than ever, and in the tremendous gusts and drenching rain it was no easy task to keep one's balance; yet this was typical of the weather in which a great part of the work has been carried out. We watched concreting in progress in a buttress-section near the track of the old road to Mardale. The concrete is conveyed by means of an aerial ropeway running above the line of the dam right across the valley. The concrete is carried in bottom-opening buckets or skips, which discharge into a hopper that feeds a rotary conveyor. The conveyor is mounted roughly central on a section of the dam, and as it rotates the concrete is spread over the whole area. Higher up this western side of the valley excavation was in progress ready for further

sections to be constructed; the concrete is everywhere based on solid rock, which for the most part is about 10 ft. below ground level.

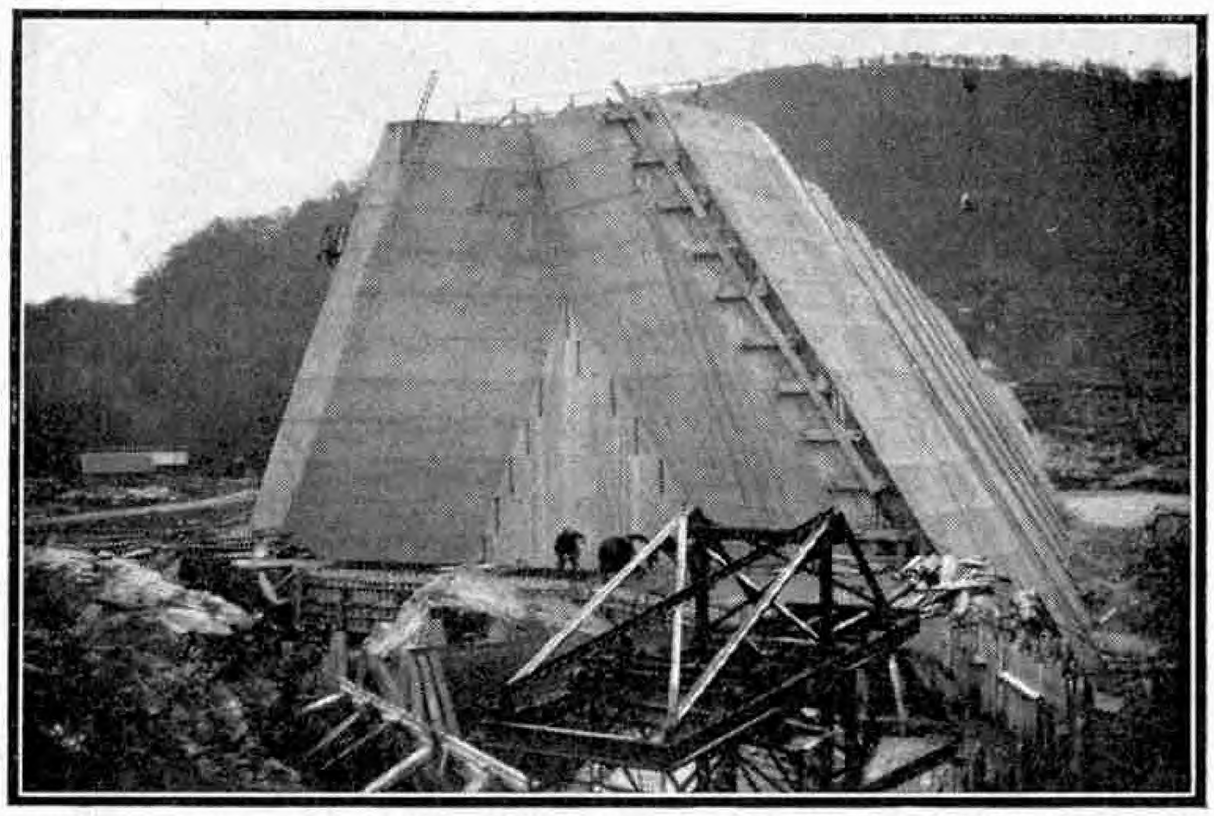
Mr. Jameson then took me down to the present lake level for a detailed examination of the partially finished sections of the dam. I was then surprised to find that there is a large hollow space inside the sections. The walls are nowhere more than 6 ft. thick on the upstream side. About 20 per cent. less concrete will be absorbed in this form of construction than in that of a solid dam. This will be obtained without sacrificing stability, and the chambers within the dam in this form of construction also provide access for inspection. In large dams leakage sometimes occurs underneath, and with a solid construction of great width at the bottom it is often very difficult to locate the exact point on the upstream face where the trouble is occurring. The hollow formation of the Haweswater Dam, and its comparatively thin walls, will make such detection work a great deal easier if leakage occurs. In addition to the hollow chambers there will be a passage running from end to end of the dam.



General view of the dam from the new road built on the eastern side of the valley, showing the buttress formation on the upstream face. On the opposite hill side is the village in which the workmen are housed.

In the very centre of the dam one section has been constructed to a height only just above the present level of the lake; this is acting as a flood weir during the period of construction, and from here too is drawn the compensation water for the Haweswater Beck. This little stream, which provided the outlet from the lake, flows northward to join the River Lowther, and the Manchester Corporation is required to maintain the present average flow of water. When the dam is completed this compensation water will be provided by two 36 in. diameter scour pipes leading through the dam. These are actually in position, and I was shown the by-pass valves on each pipe by means of which the compensation water will be used to generate electricity for use on the works and for the new Haweswater Hotel that has been built by the Manchester Corporation. At present electricity is supplied by a temporary power station having three 250 kVA Diesel-driven generators. In the power station there is a beautifully made scale model of the dam as it will appear when finished.

The greatest care is being taken to make the concrete blend harmoniously with the surroundings, and two different grades of rock are being used in its manufacture. One kind, a grey stone called dolerite, is being quarried on the eastern side of Haweswater itself; this quarry, and the light railway leading from it to the dam, are so located that when the water level is raised to its full height the gash in the hillside will lie beneath the water, and nothing will remain to disfigure the beauty of the scene. The other stone used is a pink granite, and this is being conveyed from the large quarries adjacent to the L.M.S. main line at Shap Summit. The existing roads in the neighbourhood, with their winding courses and surfaces of doubtful quality, would have been quite inadequate for the transport of materials and machinery for a job of this magnitude; and so the corporation has built a first-class private road, some five miles long, from the works adjacent to the dam to Shap Summit sidings. This has proved a great boon.



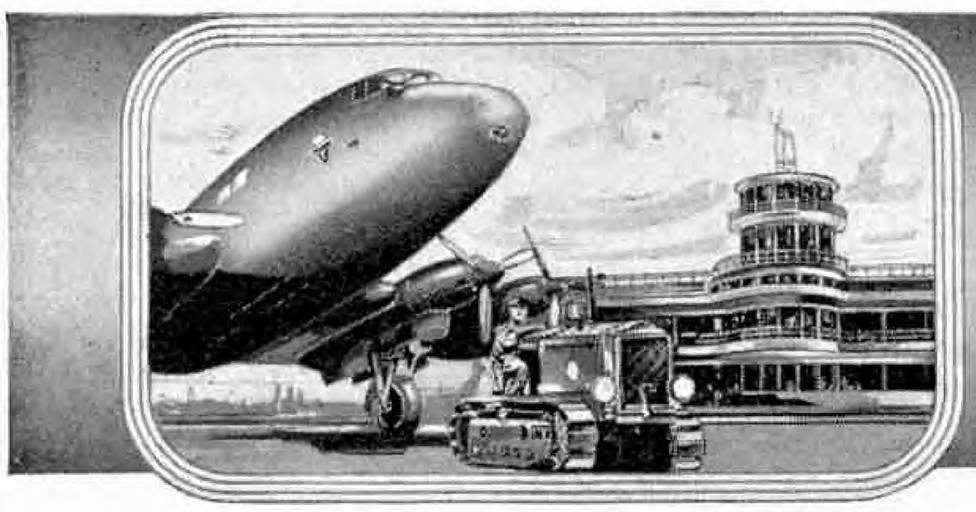
Looking along the upstream buttressed face of the dam, the concrete of which is cast with artificial joints so that it resembles masonry work.

In addition to paying careful regard to its colour, much trouble is being taken to give the concrete a handsome appearance. The long sloping wall of the downstream face, which might easily have been left completely unbroken by anything in the way of pattern, is being cast with artificial vertical and horizontal joints in the concrete. After the concreting is finished the whole face will be dressed to remove the smooth surface, and this treatment, combined with the pinkish colour and the specially cast "joints," will give the appearance of coursed cyclopean masonry work. Mention of the cast "joints" leads me to the interesting system of shuttering used. The sections of the dam are being built up roughly 4 ft. at a time. Only the portion actually being concreted is surrounded with shuttering, and as soon as the concrete has set the boards are hoisted up another 4 ft. ready for the next layer to be put on.

On the downstream side of the dam there is what is called a stilling pool; into this there discharges the compensation water passing through the two scour pipes previously mentioned and, in times of flood, the water rushing over the spillway. The turbulent flow of the water will thus be checked before it passes over a weir, where the volume of compensation water will be measured. Just below the weir a new road for access to the dam is carried across the Haweswater Beck. A most picturesque low-arch bridge has been built here, with rough granite slabs fitted loosely together in the style so typical of the Lake District. This bridge is another instance of the regard being paid to the natural beauties of the region. The beautiful little church at Mardale, once half hidden by ancient yew trees, has it is true been demolished; but the memory of it is kept very much alive by an exquisite scale model that adorns the entrance hall of the new Haweswater Hotel. This model, it is said, is accurate down to such details as the shape of every individual stone! The new road too, running on the eastern side of the lake, affords magnificent views of the wild mountain group lying behind Mardale and Riggindale—a sight that hitherto could only be enjoyed after a long and rough tramp up the open hillside.

It is anticipated that work will be sufficiently advanced for a first raising of the water level of the lake to take place during the present summer; then the central section will be raised to a height some 10 ft. above the present water level. It will be some time, however, before the water itself attains the higher level, and for many months yet construction of the dam will be in progress.

Readers of the *"M.M."* who are visiting the Lake District this summer will find a visit to Haweswater well worth while. The foot of Haweswater, where the dam is being built, is less than a dozen miles from the main Penrith-Ullswater road, and though the intervening distance includes some heavy going and some sharp bends, the pleasing scenery of the dales and a glimpse of Lowther Castle make it an interesting run. The works of course are not open to the public, but the new road on the eastern side of the lake provides a kind of grandstand from which almost every detail of the work can be watched, and from which the quiet beauty of the lower reach of Haweswater itself can be enjoyed. Intending sightseers would do well to bring field glasses with them, for then the action of the rotary concrete conveyors can be studied comfortably, no matter where they are operating. It is not often that such unrivalled opportunities exist for seeing a first-magnitude civil engineering job in course of construction.



AIR NEWS

Giant Junkers Air Liners

The latest type of Junkers air liner is the Ju 90, a huge four-engined low wing monoplane with a wing span of about 115 ft. The four 1,000 h.p. engines are of the Daimler-Benz inverted liquid-cooled type, and enable the aeroplane to attain a top speed of 255 m.p.h. Several of these aircraft are on order for important air transport firms, including two for South African Airways, for whom the Junkers company are also building a fleet of Ju 86 twin-engined air liners, some of which have been delivered.

The wing of the Ju 90 is built in five portions, the centre one of which forms part of the underside of the fuselage and has room beneath the cabin floor for heavy baggage. The illustration on this page shows the fuselage framework being covered with duralumin sheeting, and gives some idea of the great size of the aeroplane. The pilots' cabin in the nose of the fuselage accommodates three of the crew, two pilots seated side by side and a radio operator behind them. The passenger compartments have seating for a total of 40 passengers.

Record Empire Air Day Attendances

The exceptionally keen public interest now taken in the work of the R.A.F. was demonstrated on Empire Air Day, 28th May, when in spite of bad weather more people visited the R.A.F. stations open to the public than on any previous occasion. Over 80 R.A.F. stations were open, and the attendances at them totalled more than 421,000, an increase of about 68,000 on last year.

Northolt, one of the aerodromes of No. 11 (Fighter) Group, had the most visitors, with a total of nearly 23,000. Tern Hill, in Shropshire, the previous holder of the record, was visited by about 22,000 people. Civil aerodromes taking part in Empire Air Day were also well attended. The net receipts totalled about £18,000, and go to various charities.

Largest United States Flying Boat

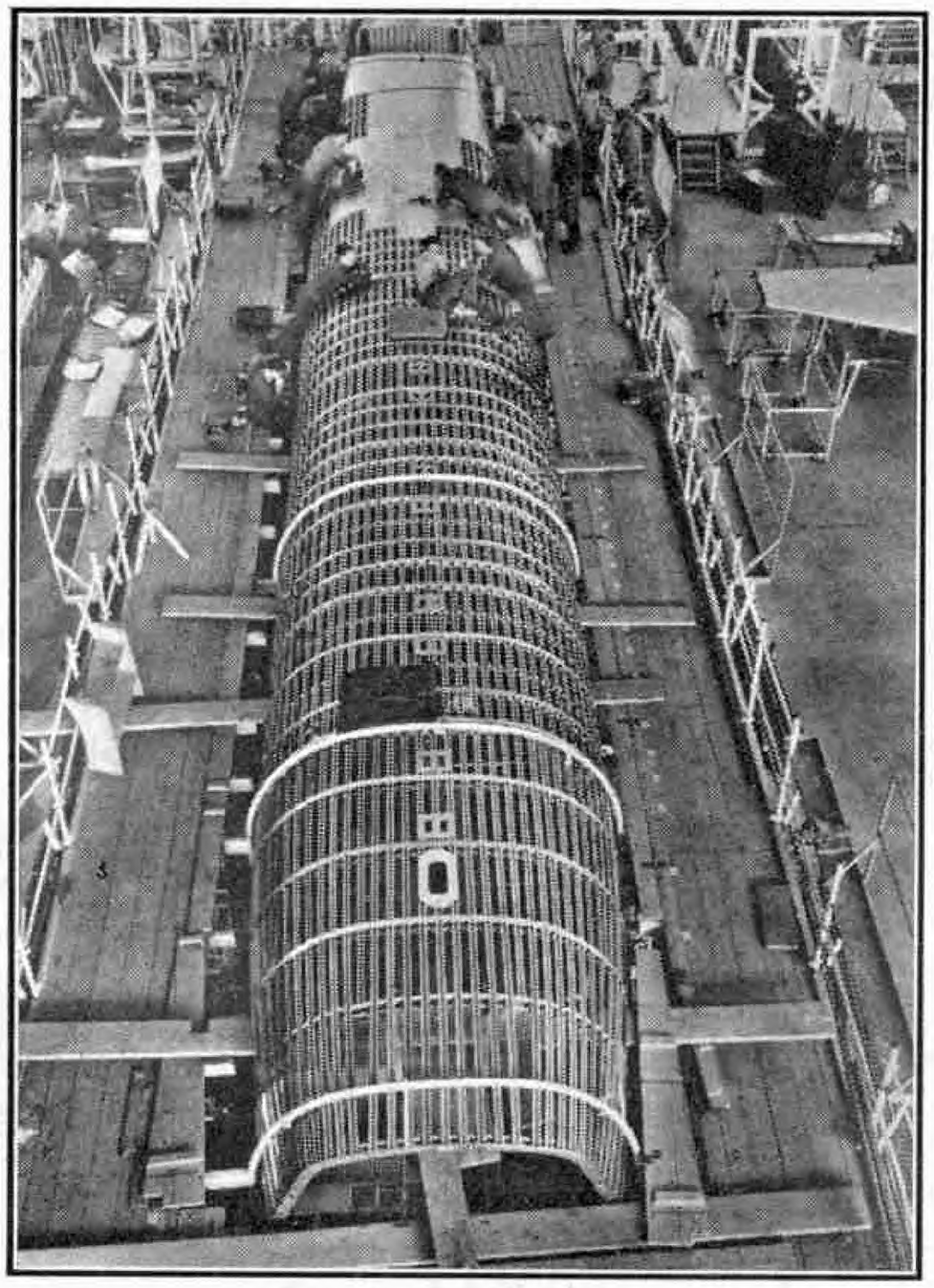
The first of six giant four-engined Boeing flying boats for Pan American Airways recently made its first test flight. It is the largest flying boat ever built in the United States, and has a wing span of 152 ft. and a length of 109 ft. The four 1,500 h.p. Wright "Cyclone" engines installed are the largest of their type ever made, and the air liner can fly on any two of them.

When ready for service the Boeing flying boat will carry a crew of eight, and will have luxurious accommodation for 74 passengers by day and sleeping accommodation for 40 at night. It has 18 rooms within the huge hull, and the four "engine-rooms" are reached by companionways through the wings. The 4,200 gall. of fuel carried will give the flying boat a range of 4,000 miles with 40 passengers on board, and would be enough to drive the average motor car 2½ times round the world.

Mid-Air Test of Insect-Destroying Apparatus

A party of medical experts, including representatives of the Ministry of Health, recently made a flight over Hythe in the Empire flying boat *"Capella"* to see a demonstration of an apparatus for destroying insect pests in aircraft when the machines are operating in tropical countries. This apparatus has been evolved by Imperial Airways in consultation with technical experts. In order that the demonstration might be a convincing one the London School of Hygiene provided cages containing several hundred live tropical mosquitoes.

While the flying boat was in the air the apparatus was brought into use and sprayed the whole of the interior of the aircraft with a special non-inflammable insecticide. This killed all the mosquitoes without in any way inconveniencing the passengers or causing any damage to the upholstery or fittings.



Building a Junkers Ju 90 air liner. The task of covering the massive fuselage framework with duralumin is begun at the stern. Photograph by courtesy of Junkers Flugzeug- Und -Motorenwerke A.-G., Dessau.

The 1938 King's Cup Air Race

The 17th annual King's Cup Air Race was held at Hatfield on 2nd July in good weather. It was a triumph of youth and of Percival aircraft, as first and second places were won by the youngest competitors, and both flew Percival "Mew Gulls."

The winner of the first prize and the King's Cup was A. Henshaw, the 24-year old pilot who finished third in the recent Manx Air Derby. In the King's Cup Air Race his average speed was 236.25 m.p.h. When he arrived at Hatfield at the conclusion of the race cheering mechanics carried him shoulder high to the enclosure where Sir Kingsley Wood, the Air Minister, presented him with the Cup. He also received a message of congratulation from the King at Windsor Castle.

Second place was won by G. Guthrie, aged 22 years, whose average speed during the race was 220.5 m.p.h. L. T. H. Cliff, flying a Miles "Hawk Major," finished third, his average speed being 146.25 m.p.h.

The race was flown over a distance of 1,013.14 miles, and consisted of 20 laps of a triangular course that began and finished at Hatfield aerodrome, with Buntingford, Herts., and Barton airport, Beds., as the other two corners. These turning points were indicated by pylons painted in black and yellow check. At the end of each five laps the competitors had to make a compulsory halt of 40 min., during which time their aircraft were refuelled. The race was a handicap, and Henshaw, the winner, was the 18th of the 25 competitors who took off from Hatfield. Flying Officer Clouston, in a B.A. "Eagle," was the only one unlucky enough to have to retire during the race, and his withdrawal was due to petrol stoppage in a tank of his aeroplane.

Isle of Man Air Races

The annual Manx Air Race on 4th June, was again marred by bad weather, but in spite of this all the competitors completed the course, which was from Hatfield to Ronaldsway, with a compulsory stop at Speke, and control points at Stanley Park, Blackpool, and St. Bee's Head. The race was won by S. T. Lowe, who flew a Comper "Swift" and averaged 159.5 m.p.h. The highest speed was set up by A. Henshaw, who flew a Percival "Mew Gull" and attained 247.5 m.p.h.

Bad weather on 6th June caused the Manx Air Derby and the Tynwald Race to be postponed until the next day, when the Manx Air Derby was won by J. Rush, who flew a Hawker "Tomtit" and achieved a speed of 117 m.p.h. The second place was won by Herr Ernst Gerbercht, in a Focke-Wulf "Stieglitz," and the third by A. Henshaw. The Tynwald Air Race was won by S. T. Lowe, in his Comper "Swift."

Royal Air Force Vacancies

The expansion of the Royal Air Force is being greatly accelerated, and the Force is being increased to an extent unprecedented in time of peace. During this year over 31,000 men and boys are to be enrolled, a total equal to the entire strength of the R.A.F. before 1935. This huge total will consist of 2,100 pilots, 550 observers, 26,000 tradesmen and unskilled men, and 3,000 boys; and an intensive national recruiting campaign is being carried on to obtain the recruits.

Candidates for pilot vacancies should be between 17½ and 25 years of age and educated to about School Certificate standard. They will be entered as officers on short service commissions, and will be appointed for four years' service on the active list, followed by six years' service in the Reserve. Air observers hitherto have been provided solely from among serving airmen, but most of the 550 observers now required will be recruited direct from civil life. Candidates should be between the ages of 18½ and 25 years and have a good standard of education. Service will be for four years, followed by six years in the Reserve.

The 26,000 tradesmen and unskilled men required include about 9,000 men for training as flight mechanics or flight riggers, for duties in connection with the maintenance of aircraft. About 8,000 men are also required for training as armourers, wireless operators, electricians, instrument repairers, or photographers. Applicants should have been educated at a Secondary, Junior Technical, or Central School, or have had some experience in one of these trades. The candidates accepted will be enlisted for six years' service on the active list. Experienced fitters and metal workers also are required to undertake the highest classes of mechanical work in the Service.

Large numbers of unskilled men are needed as aircraft hands, and they will serve for seven years. There also will be 3,000 openings for boys as aircraft apprentices, boy entrants and apprentice clerks. The age limits are approximately 15 to 17 years, and candidates accepted will receive a thorough course of training, varying from one to three years according to the trade. Later a number may become pilots.

Applications from candidates qualified for entry into any of these classes may be addressed to any R.A.F. recruiting office, or to the Under Secretary of State, Air Ministry, London W.C.2. Envelopes should be marked "Pilots," "Observers," or "Airmen," according to the class of application.

Another R.A.F. School for Aircraft Apprentices

The new R.A.F. school for aircraft apprentices at Cosford, Staffs., was opened on 15th July. It will be known as No. 2 School of Technical Training (Apprentices), and will be used for training aircraft apprentices as fitters. A large number of airmen will also be trained as flight riggers and flight mechanics.

The school will begin this month with 250 new entrants and 500 aircraft apprentices transferred from No. 1 School of Technical Training (Apprentices), Halton. This total of 750 will be increased gradually until there are about 4,000 apprentices and airmen at the school. It is expected that the full number will be attained next year, and the educational and technical staff will then total about 450. The educational and technical training of the three-year apprenticeship course will be similar to that given at Halton, where nearly 5,000 boys are now receiving tuition.

* * * *

The latest Cierva Autogiro is the C.40, a two-seater semi-enclosed machine with a 203 h.p. Salmson engine. The first C.40 has made successful trial flights, and the Air Ministry have ordered five of these machines for Army Co-operation duties.



Dornier Do 18 flying boat, a type of Diesel-engined aircraft that has done good service on the South Atlantic air mail route of the Deutsche Luft Hansa. Photograph by courtesy of Dornier Metallbauten G.m.b.H., Friedrichshafen.



A Focke-Wulf "Stösser" Trainer viewed from an unusual angle. This aeroplane is described in a special article on page 444. Photograph by courtesy of Focke-Wulf Flugzeugbau A.-G., Bremen.

England to Australia by Empire Flying Boat

The 13,000 mile England-Australia air route of Imperial Airways is now operated throughout by Empire flying boats, in 9 days 2 hrs., and is the longest direct air route in the world. The conversion has been effected in stages, the last being the Singapore - Australia section worked by Qantas Empire Airways, a company in association with Imperial Airways. The Qantas company have now changed over from "Diana" class landplanes to Empire flying boats, of which they have a fleet of six.

The first all-flying boat service from England to Australia was inaugurated on 26th June, and the bookings for this historic trip were so heavy that two flying boats had to be employed for the Southampton-Singapore part of the journey. The flying boat *"Camilla"* took off from Southampton at 5.15 a.m. and was followed 30 min. later by the *"Cordelia."* At Calcutta the *"Camilla's"* passengers were transferred to another Empire flying boat, the *"Challenger,"* and at Singapore passengers in the *"Cordelia"* who were proceeding farther joined those in the *"Challenger,"* which was taken over by a crew of Qantas Empire Airways and continued the flight to Australia alone. After leaving Koepang the flying boat ran into thick clouds, and the 500-mile flight across the Timor Sea to Darwin was made at an average height of between 12,000 and 13,000 ft. over a two-mile bank of cloud. Darwin airport is not yet provided with lighting equipment, but the *"Challenger"* managed to reach there by sunset. The 11,000 miles from England had been covered in 7 days 4 hrs., and the actual flying time was 67 hrs. 51 min.

At Darwin the sea was very choppy, and a fuelling tender broke away from its moorings and crashed into one of the wing-tip floats of the flying boat. It was necessary to detain the aircraft for examination, and this caused a day's delay in reaching Townsville and Sydney.

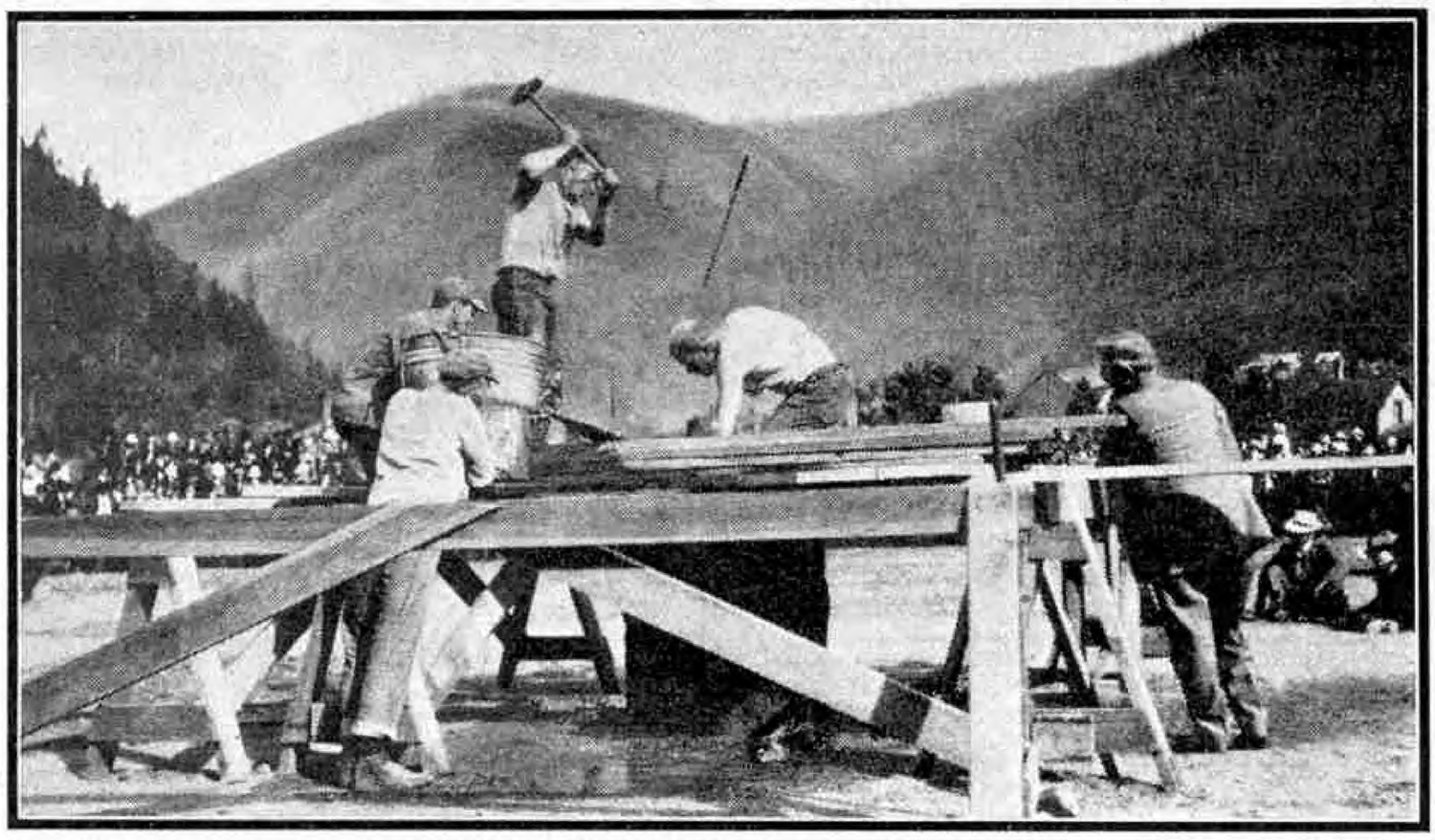
Flying boats cannot utilise airports lacking a suitable stretch of water, and therefore the England-Australia air route has been revised for the all-flying boat service. The Australian terminus is now Sydney, instead of Brisbane. When this service has been in operation a few weeks it will be speeded up so that passengers will be able to fly from England to Australia in seven days. Thus within four years the time taken for a commercial flight between these two countries will have been almost halved.

Champion Hammermen of the Far West

Thrills of Rock Drilling Contests

AMONG the most exciting and strenuous competitive events in the world are the hand drilling contests that are held in the Western States of America, particularly in Colorado and Arizona. They had their origin in the mining camps towards the end of last century, when holes for blasting were largely drilled by hand. Swinging a hammer day after day developed many expert drillers, and there was keen rivalry for pre-eminence. Each camp had its own champions, who matched their brawn and skill in contests held on holidays, when large prizes were offered for competition. At least one event usually was billed as for an American or world title, and in some large and important camps, at which the greatest prizes were offered, there were several described as for world championships. Such meetings are now less common, for few of the miners of to-day practise drilling by hand, but matches are still staged and some of the feats of modern champions are not far behind the records set by the greatest figures of the past.

There are two classes of drilling. In one of these, known as single-hand drilling, the striker uses a light hammer and holds his own drill. Double-hand drilling, as the second type of contest is known, is far more spectacular. In this the drill is struck by a "double-jack," or hammer requiring two hands to wield it. This means that teams of two men take part, one man striking and the other holding the steel drill and twisting it round in the hole after each blow. A third man known as a "swamper" directs a jet of water into the hole to wash out the granite chippings, which would hinder the progress of the drill if they are allowed to remain in the hole.



An exciting moment during a hand drilling contest in Western America. The man on his knees is "turning," and has just exchanged a steel drill for a longer one. The drill thrown out of the hole is visible above his head. Photograph by courtesy of the "Compressed Air Magazine."

A block of granite is used for drilling contests, and is divided into 4-in. numbered squares. Competitors draw for drilling positions and the order in which they shall work, and the winning team is the one that drills the deepest hole in the allotted time, usually 15 minutes. Good steels are essential for success in a championship event. As a rule they are specially prepared by a skilled blacksmith, and each team or individual starts with 15 of varying lengths, the first one employed being the shortest and the remainder being successively 3 in. longer. The bits are gauged with special care to an accuracy of as much as a thousandth of an inch in order to prevent binding and are carefully tempered. The weight of the hammer is 8 lbs. and there is no restriction on the length of the shaft. A fast striker generally uses a short handle, a slow striker a proportionately longer one.

To see an expert double-hand drilling team at work is thrilling in the extreme. The two men alternate in striking and holding the steel, changing their positions every minute or so without missing a stroke, and the steels are changed with equal speed and precision. Mr. W. E. Carr, of Spokane, Washington, who worked with some of the crack hand drillers of the past, gave a vivid account of these operations in a recent issue of the *"Compressed Air Magazine."* He writes: "One man is on his knees turning the steel and the other is hammering, and they alternate every minute or half-minute, as they choose. At the instant of change each has a hammer in his hands and both strike two blows while they are shifting. Under the strict rules that govern the contests, the man who is changing from hammering to turning is not permitted to strike more than two blows, otherwise the team will be penalized.

"Changing steel every minute is a man's job. To throw a long piece of steel from the hole and to place the next and longer one in it while the hammerman is raising his hammer requires strength, skill, coolness, and extremely fast action, especially when the striker is swinging at the rate of as many as 85 or 90 blows per minute. Yet the hammerman does not break his rhythm; and if one were not looking, it would be impossible by timing the blows to tell when the change was made. The used steel flashes into the air, and the one replacing it is smacked to the bottom of the hole a split second before the hammer descends on it. It is, indeed a thrilling sight to see two expert drillers perform this feat."

Training for these events is as serious as that of recognised athletes. After a strenuous spell of practice in striking and changing steels would come a run of several miles in the hills to improve the wind, followed later by limbering-up exercises. One famous old-time competitor developed a specially-shaped hammer head to give more weight behind the striking surface. He attributed much of his success to this improvement, and some commercial hammers are now made in a similar manner.

The greatest of all double-hand champions were E. Chamberlain and C. Maka, who in 1903 set up a record that has never been broken by drilling to a depth of 46⅝ in. in Gunnison granite, a hard rock used for many years in all official contests. Other well-known names include those of M. Kinsella and C. Leis, who are shown in action in the photograph reproduced on this page. A steel thrown out of the hole can be seen falling in the background, and although it is still in the air, a longer steel has already been thrust into the hole by Kinsella, ready for the stroke of Leis' hammer. The "swamper" is on the left, just behind the striker.

There is a variety of double-hand drilling in which one man wields the hammer for the whole 15 minutes without a break whilst his partner does the turning. The most famous champion in this class was W. G. Tarr, who in a match in 1903 set up an all-time record with a depth in Gunnison granite of 38⅝ in. Tarr started by delivering 70 blows a minute, but when he warmed up he increased the number to 85 and kept going at this rate for the rest of the 15 min., swinging a hammer with a head weighing over 9 lb.

Single-hand drilling is not as exciting as that in which two men take part. The hammer used weighs 4 lb., and its greatest exponent was F. Yockey, a Colorado man who made a record by drilling a hole 26⅝ in. deep in Gunnison granite in 1903. Yockey was remarkable for his speed. When creating his record he averaged 144 strokes a minute for the 15-minute period. He had studied his movements and had practised until his timing was perfect, his steel being turned and his blows struck in perfect rhythm.

Among modern champions an outstanding figure is F. Dopp, another Coloradoan, who at the age of 54 holds the field against all comers in single-hand competitions. In 10 minutes he has reached a depth of 18½ in., which works out at 27¾ in. for 15 minutes, considerably more than Yockey's record. The two performances cannot strictly be compared, however, as they were made in different circumstances and using different varieties of granite. The reigning double-hand champions are G. and M. Coughlin, whose drilling feats also compare very favourably with the records of the past.

For the information in this article we are indebted to the courtesy of the *"Compressed Air Magazine."*

An Electric Bus Inspector

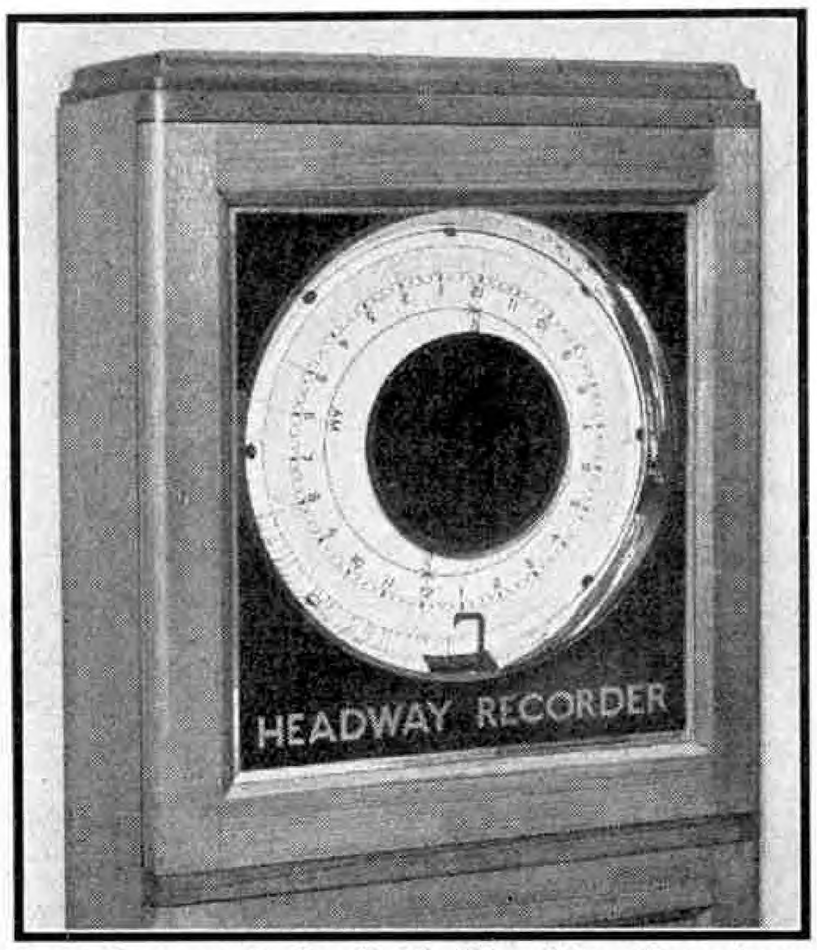
Invisible Waves Regulate London Service

By T. R. Robinson

THE increasingly busy streets of our great cities make it difficult to operate bus services efficiently, and to space the vehicles evenly along their routes. Traffic delays due to congestion in passing through crowded centres cause the buses to collect into groups, with the result that some are overcrowded and others are run almost empty.

In an attempt to overcome this problem in the London area, and to enable a central control office to regulate the movements of buses, the London Passenger Transport Board have installed an experimental "headway recorder" at the omnibus station, Victoria, London, S.W., and it is being used with success to check the running of buses on Route 44, which have been equipped with the necessary apparatus. The recorder is somewhat similar to one already in use for checking the "headway," or interval between vehicles on trolley-bus and tramway routes, but as motor-buses have no wires or rails that can be used to convey signals, electro-magnetic induction is employed as the link between the buses and their recording clock.

Each bus is fitted with a small transmitter unit, consisting of a buzzer and a transformer, both fed with current by the normal 12-volt accumulator battery of the vehicle. The reed of the buzzer vibrates between two contact points, one of which is the make-and-break of the buzzer magnet circuit, whilst the other interrupts the circuit through the primary winding of the transformer and enables the 12-volt current to generate an alternating current in the transformer secondary winding. This alternating current is conducted to an "energiser coil" fitted to the roof of the omnibus, and the magnetic field set up is used to signal the passing of the bus to the receiving equipment of the recorder at the control office.



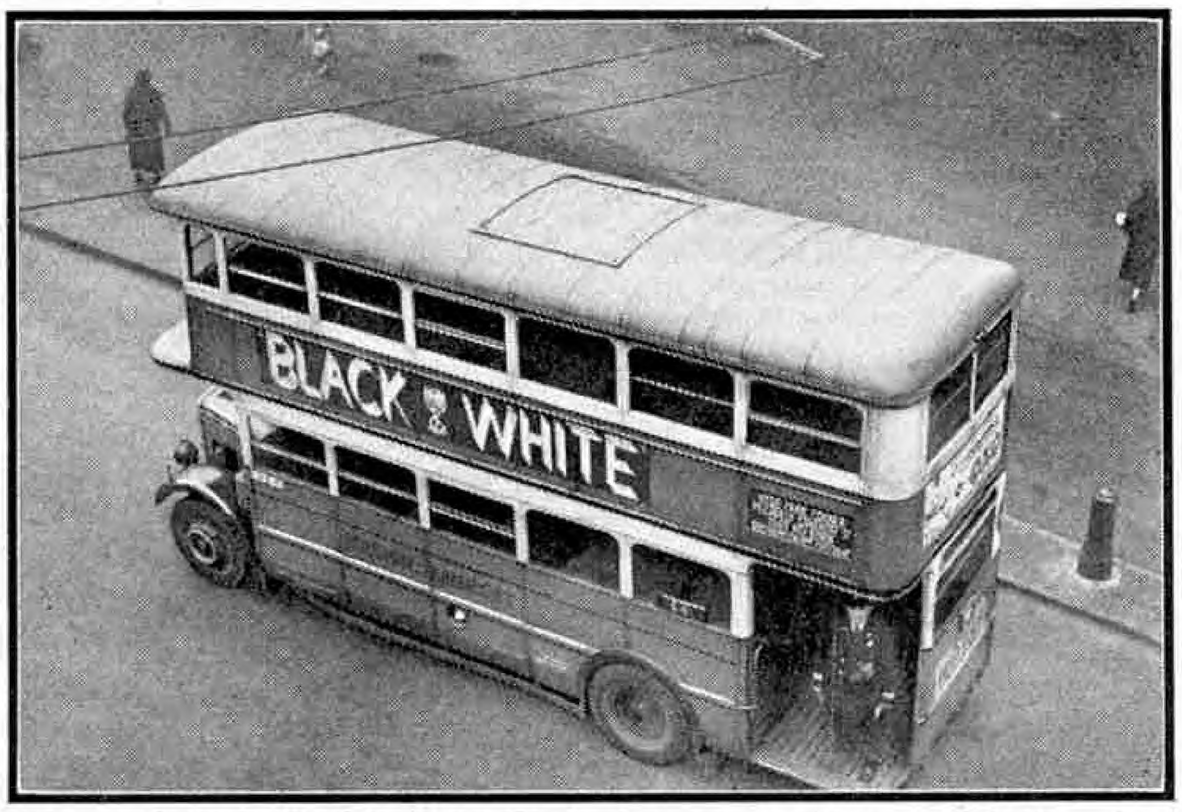
The headway recorder described in this article, with marks on the lower left hand side of the dial recording the passing of buses.

At the receiving point, a "pick-up coil" is erected across the road in such a position that the buses pass under it. As each bus passes along the roadway, its movement brings the energiser coil on its roof under the pick-up coil of the receiver, and an induced impulse of current is set up in the latter.

This impulse is magnified by a 7-valve amplifier, and the stepped-up current is then passed over wires connecting the receiving point with the control office, where a second amplifier magnifies the impulse further before passing it to yet another amplifier, which responds only to impulses of definite frequency. The output from this final amplifier is used to trip a relay that brings the printing mechanism of the recorder into action.

The recorder is fitted with a clock mechanism that rotates a circular paper dial on which are marked 24 hourly divisions, and each impulse from the pick-up coil operates the printing hammer of the recorder, marking a radial line on the edge of the dial. If each bus follows that before it at the proper interval, the markings around the edge of the dial are equally spaced, but the markings instantly reveal uneven running due to congestion by lack of regularity in their positions.

Each paper dial is changed when the service ends for the day. The one taken out is filed away for reference, and thus delays can be studied and traced, and those that recur on certain days of the week, or are of special importance for some reason, can be investigated more thoroughly in detail.



A bus passing under the pick-up coil of the headway recorder. The transmitting frame is on the roof of the bus. Illustrations by courtesy of the London Passenger Transport Board.

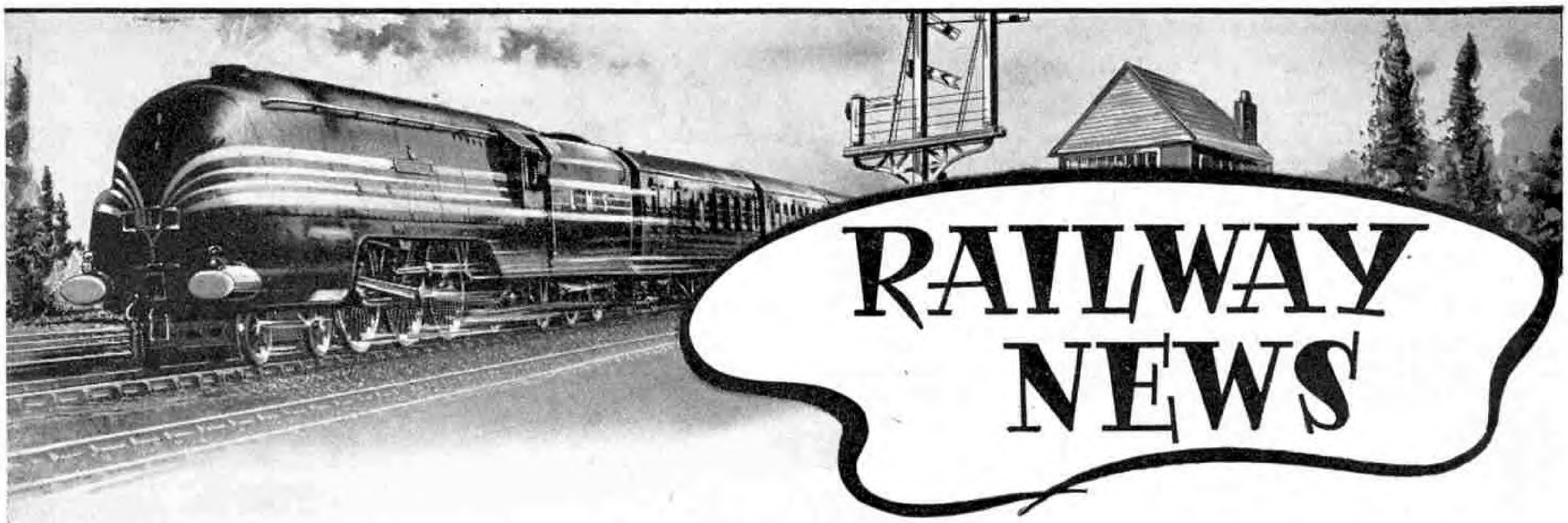
The purpose of the tuned-frequency amplifier that carries out the final step-up of the received impulse is very ingenious. The reed of the buzzer of the omnibus transmitter unit is so constructed that it can be tuned, and tuning arrangements are also fitted to the transformer circuits of the unit. With the reed and circuits matched in tune with each other, the alternating current produced in the transformer is of a definite frequency, and if all units on buses of any particular route are tuned alike, the amplifier at the control station can be adjusted to select only those impulses that come from vehicles on the service which it is recording. Tuned amplifiers adjusted to different frequencies can be connected to the output of the second amplifier, and so the passage of buses working on several routes that happen to pass under one pick-up coil can be checked and recorded without any mutual interference.

The transmitter units are housed in stout cast metal cases and can be plugged in to connections on the buses, so that units of various tuned frequencies can be fitted and changed rapidly when a bus is transferred from one route to another. The units work continuously during the running of the buses, and are very strongly constructed to withstand rough usage and long periods of operation.

The energiser coil on the bus has 15 turns of wire and the pick-up coil 100. In the present experimental installation the coil is suspended above the bus roof, but if necessary it can be located underneath the road surface and the energising coil placed below the floor of the vehicle without interfering with the action of the recorder.

If the method is adopted generally for recording omnibus headway on Central London services, pick-up coils will be placed at various points, and the wires connecting these with the central control office will pass along the tube tunnels of the underground railways. This will enable the whole system to be linked up, and as irregularities of service appear, adjustments will be made to restore the route conditions to normal and remove the congestion. The pick-up coil of the present equipment is at Victoria, but the recorder is at the London Passenger Transport Board Headquarters at 55, Broadway, Westminster, the connecting wires running through the tunnel from Victoria to St. James Park station. There is really no limit to the distance that separates the pick-up coil and the recorder, and if necessary duplicate recorders can be fitted at various points in order to give more complete control of omnibus movements.

The technical information in this article is reproduced by courtesy of the London Passenger Transport Board.



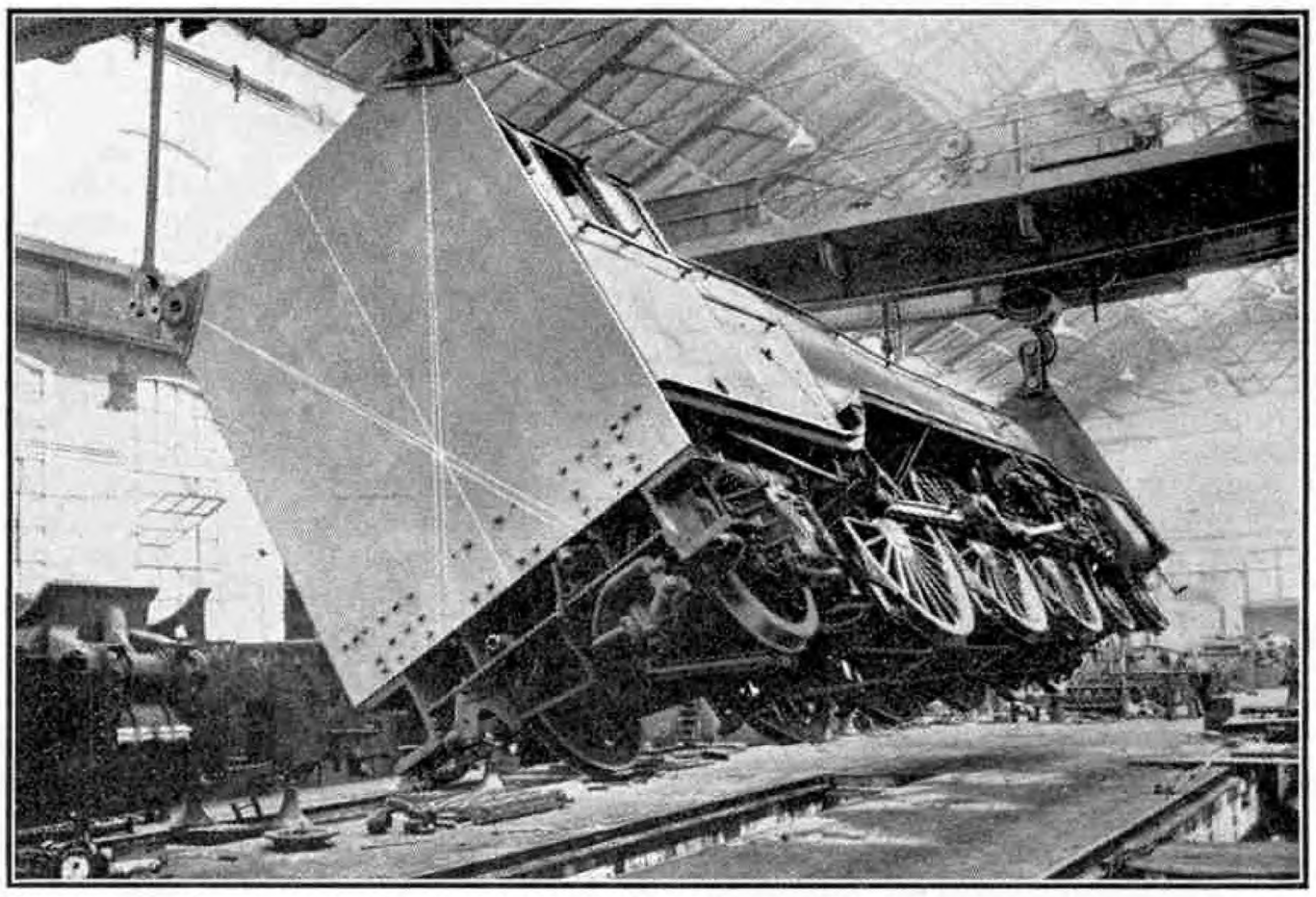
RAILWAY NEWS

Locomotive Centres of Gravity

The illustration on this page shows an interesting experiment at the Doncaster Works of the L.N.E.R. The object was to find the actual centre of gravity of one of the Gresley "Pacific" locomotives and, incidentally, to test the accuracy of the design in relation to the formula for calculating the centre of gravity.

The method of carrying out the experiment was to attach substantial steel plates to the front and to the back of the engine, which was then suspended from each of the top corners of the plates in turn. Where a plumb-line from each corner intersected the centre line marked on the steel plate was the centre of gravity. This was found to be 5 ft. 11 $\frac{13}{16}$ in. from rail level, as compared with the calculated height of 5 ft. 11$\frac{1}{4}$ in. with the engine in working order. It is a remarkable tribute to the soundness of the design of the engines that a test of this kind gives a result so close to the calculated one.

The existence of duplicate plumb-lines on the plate shown in the photograph is explained by the fact that the test was carried out also with the engine empty. In that case the centre of gravity was found to be 5 ft. 7$\frac{7}{8}$ in. from the rail.



Finding the centre of gravity of a Gresley "Pacific" at Doncaster. This interesting experiment is explained in the accompanying paragraph. Photograph by courtesy of the L.N.E.R.

In these high-speed days the height of the centre of gravity is of increasing importance on account of its effect on the stability of an engine when rounding curves. In this country at least not a great deal of attention appears to have been given to the matter, although a similar test to the Doncaster experiment just described was carried out at Horwich years ago with one of the 2–4–2 tank engines of the former Lancashire and Yorkshire Railway.

Thrilling L.M.S. and L.N.E.R. Runs

Mr. D. S. Barrie sends us details of the following runs:

An engine failure north of Carlisle caused the 12.16 p.m. L.M.S. express from Perth to London to have a 22-min. late start from Carlisle, but it paved the way for a spectacular feat of time-recovery on the part of the 4–6–2 engine No. 6209 *"Princess Beatrice."* Up the long pull to Shap Summit speed never fell below 41 m.p.h. on the steepest part of the ascent, and *"Princess Beatrice"* hauling 420 tons breasted the Summit, 31$\frac{1}{4}$ miles from Carlisle, with 7 min. of the leeway already recovered. At Lancaster, the first stop, 10 min. had been made up and Preston saw another minute regained. In spite of permanent way and signal checks in the Wigan area, Crewe was reached with another 5 min. of the arrears won back.

Here Driver Clements of Crewe handed over the engine to Driver Jackson, of the same depot, who soon showed, by a 50 m.p.h. ascent of the 1 in 177 bank between Betley Road and Madeley, his determination to wipe out the 9 min. deficit that confronted him on starting the last stage to London. This proved, in such capable hands, almost "child's play" to the great engine, so that without the maximum speed ever reaching 80 m.p.h. Tring was passed two minutes early, after the 15 miles uphill from Bletchley had been covered in 13 min., and *"Princess Beatrice"* was eased down on the last stage of the run to prevent too early an arrival. Actually the train reached Euston two minutes early, No. 6209 having covered the 158.1 miles from Crewe to Euston in 150 min. at an average speed of 63.2 m.p.h., and the 299.1 miles from Carlisle in an actual running time of 302 min. 36 sec. Including intermediate delays, 28 min. went to the credit of engine and men.

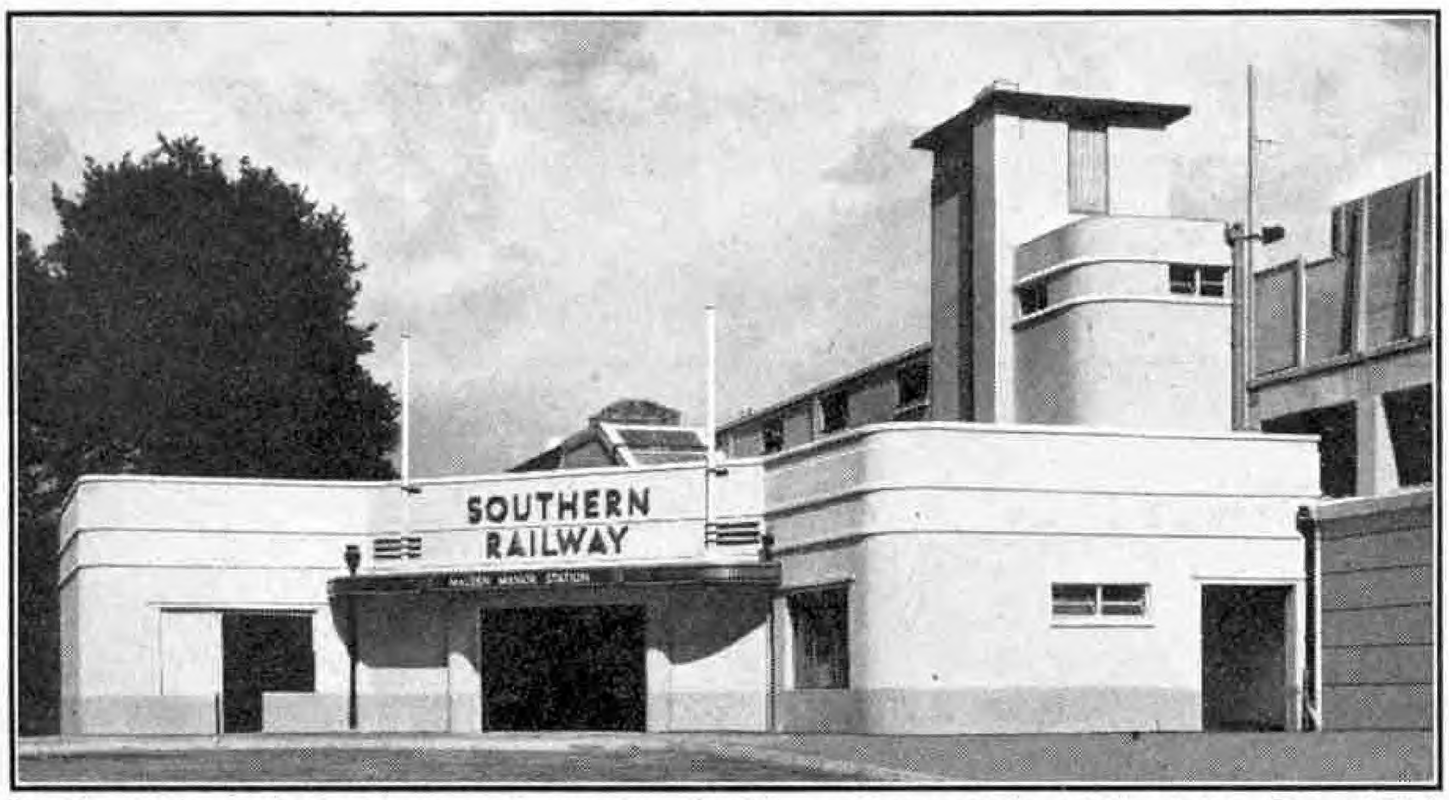
"No. 10000," the former high-pressure L.N.E.R. compound locomotive, now a three cylinder simple 4–6–4, was recently observed on the 4 p.m. King's Cross to Leeds. The train, weighing about 410 tons full, left Peterborough 3 min. late, and on the easy gradients at the start the mile-a-minute rate was soon attained. Helpston Box, 5.5 miles, was passed in 7$\frac{3}{4}$ min. at 67 m.p.h., and Essendine, 12.2 miles, in 13$\frac{1}{2}$ min. at 70 m.p.h. after nearly four miles rising at 1 in 440 and 1 in 264. On the initial stretch of the formidable ascent to Stoke, of 4$\frac{1}{2}$ miles at 1 in 200 through Little Bytham, speed fell from 73$\frac{1}{2}$ m.p.h. to 63$\frac{1}{2}$ m.p.h. There is an easy 1$\frac{1}{2}$ miles through Corby on which speed picked up to 65 m.p.h., and then the final three miles at 1 in 178 up to the summit at Stoke Box were taken at a minimum speed of 60 m.p.h., rising to 61$\frac{1}{2}$ m.p.h. at the top of the bank. Thus Stoke Box, 23.7 miles from the start and with half this distance on fairly stiff rising gradients, was passed in 23 min. 52 sec. "Even time" was exactly attained at Great Ponton, and with a final maximum of 75 m.p.h. on the descent through this place the train stopped at Grantham in 29 min. 35 sec. for the 29.1 miles from Peterborough. *"No. 10000"* had achieved in this short run a gain of 5$\frac{1}{2}$ min. on booked time.

Australian Cricketers on L.N.E.R.

When the Australian cricket team left King's Cross for Sheffield in June, the locomotive that hauled their train to the steel city was the L.N.E.R. streamlined flier, No. 4491 *"Commonwealth of Australia."* Before leaving London members of the team were given an opportunity of inspecting the engine. Mr. W. Whitelaw, Chairman of the L.N.E.R., Sir Ralph Wedgewood, Chief General Manager, and Sir Nigel Gresley, Chief Mechanical Engineer and designer of the locomotive, were present to see the team depart.

Locomotive Working on the Mid-Sussex Line

The completion of the S.R. electrification scheme via Dorking, Horsham, and the Mid-Sussex line has brought to an end a most interesting and varied steam locomotive working. The road is a very hilly one, but owing to weight restrictions such otherwise ideal locomotives as the "Schools" and "King Arthurs" were not permitted to run. The smartly-timed express train service to Bognor, Littlehampton and Chichester was worked by a link of curiously assorted locomotives, but these did the job remarkably well despite their age. At times 4–4–0s of all the three constituent companies of the S.R. might be noted, though the use of the S.E.C.R. Class "L" locomotives and their S.R. developments of class "L1" was somewhat rare. The bulk of the work was done by engines of the former L.B.S.C. and L.S.W. Railways.



The S.R. station at Malden Manor, on the new loop line between Motspur Park and Chessington. The station is described on this page. Photograph by courtesy of the S.R.

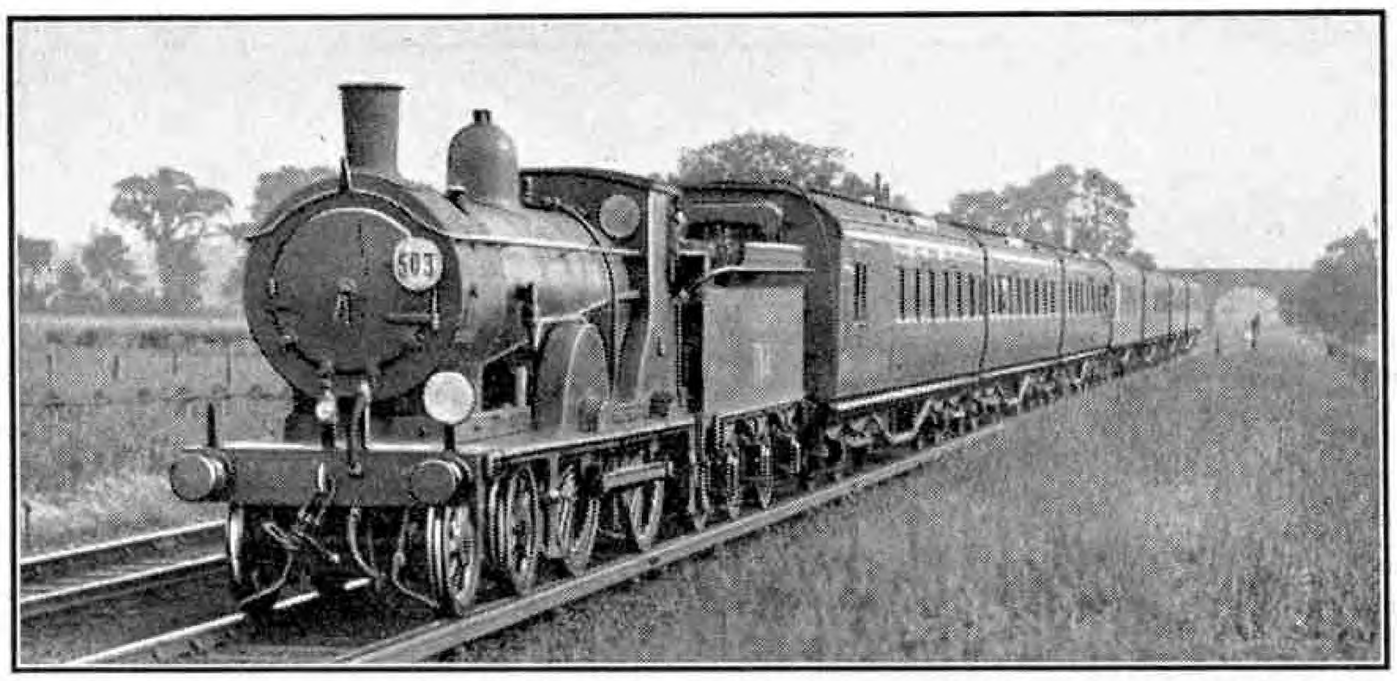
Of the Brighton types there were Col. L. Billinton's Class "B4X" rebuilds of his father's famous "Emperor" class 4–4–0s, the Earle-Marsh "Atlantics," and the same engineer's 4–4–2 superheater tanks of class "13." The L.S.W.R. were represented by two classes of Drummond 4–4–0s, the little "Greyhounds" of 1899, now fitted with superheater boilers and tall stove-pipe chimneys, and the larger "415" class. One of the former engines, No. 704, appears in the accompanying illustration.

Details of some runs timed by Mr. O. S. Nock just before the change-over to electrification show what excellent running was the usual order of the day. One of the "Atlantics," No. 2041 *"Peveril Point,"* was very much at home on a moderately loaded up Bognor express of 275 tons gross. The start from Arundel was hampered by a relaying slack near Amberley, but then No. 2041 got away well across the level of the marshes, touching 62½ m.p.h. Fine work followed over the sharp ups and downs onward to Horsham, the extremes of speed being 43 m.p.h. up the stiff 2 miles at 1 in 100 beyond Pulborough, and 65 m.p.h. through Billinghurst. So Horsham, 20.6 miles, was reached in 25½ min. from Arundel. On another run a 4–4–2 tank, No. 2030, made a very smart trip with a 250-ton load. Recovery from the Amberley check was swifter, with a top speed of 64½ m.p.h. across the marshes.

Some remarkably good hill-climbing distinguished the run of *"Peveril Point"* north of Horsham. The line falls a little in the first two miles, but then comes a gruelling pull up to the North Downs, nearly six miles, varying in steepness from 1 in 111 to 1 in 90. *"Peveril Point"* got away in tremendous style, touching 55 m.p.h. at Warnham, and then going right up the bank without falling below 40 m.p.h. Speed was allowed to rise to 69 m.p.h. on the sharp descent from Holmwood, and Dorking, 13.5 miles, was passed in 18 min. at greatly reduced speed; but a series of delays by signals, in addition to the severe speed restriction always enforced through Epsom, made the next 11.8 miles to the stop at Sutton take 19½ min.

With this the work of one of the little Drummond "Greyhounds" No. 729, makes a highly interesting comparison, as the veteran was loaded to no less than 340 tons. Speed was quickly attained out of Horsham; Warnham was passed at 48 m.p.h. and then came a gradual fall to 25 m.p.h. at Ockley Summit. But with a top speed of 67 m.p.h. in descending from Holmwood, Dorking was reached in 20½ min. The restart was extraordinarily brisk, for at Leatherhead, after four miles of practically level road, speed was up to 60 m.p.h.; and the stiff rise to Epsom Common, 2¼ miles at 1 in 112-128 was cleared at 41 m.p.h. Then came the 25 m.p.h. slack through Epsom itself, and Sutton, 11.8 miles, was reached in 17¾ min. from Dorking.

The last 12.1 miles into Victoria hardly permit of any spectacular times, but No. 729 reached 58 m.p.h. at Hackbridge, and her start-to-stop time of 14½ min. for the 9.4 miles from Sutton to Clapham was quite smart under the circumstances. Victoria was reached in 21 min. from Sutton.



An up Bognor express near Mitcham Junction on the Mid-Sussex line, shortly before electrified services began. The engine is "Drummond" 4-4-0 No. 704. Photograph by E. R. Wethersett.

A British Speed Record

During the course of a trial run on Sunday 3rd July, the L.N.E.R. *"Coronation"* streamlined express train with dynamometer car attached attained a maximum speed of 125 m.p.h. This speed was sustained for 306 yds. near Little Bytham Station and was only reduced on account of the approaching junction at Essendine. Prior to reaching this maximum 120 m.p.h. had been sustained for approximately 3 miles.

The train was conveying a special party of engineers and whilst the record was being made tea was being served on the train. Observers reported that the riding of the train was so smooth that none was spilled.

This is the highest speed yet attained by any British steam locomotive, and is confirmed by the dynamometer car chart.

The locomotive was No. 4468 *"Mallard,"* one of the type of streamlined Pacific locomotives designed by Sir Nigel Gresley, C.B.E., Chief Mechanical Engineer of the L.N.E.R., for the purpose of hauling the Company's streamlined expresses. It was built at Doncaster Works in March 1938 and is stationed at Doncaster; on the record-breaking run it was driven by Driver J. Duddington and Fireman T. H. Bray of Doncaster. Locomotive Inspector J. Jenkins of London rode on the footplate.

"Mallard" belongs to a class of locomotives noted for speed and, although in normal service the L.N.E.R. streamlined trains do not require to exceed a maximum of 90 m.p.h. to ensure punctuality, these engines have on many occasions demonstrated their capacity for much higher speeds, 100 m.p.h. having been exceeded on test runs and other special occasions. Of these records the most notable have been 112½ m.p.h. twice with locomotive *"Silver Link"* hauling *"The Silver Jubilee"* train on 27th September 1935; 113 m.p.h. with *"Silver Fox"* on 27th August 1936, and 109 m.p.h. with *"Dominion of Canada"* at the head of the *"Coronation"* train on 30th June 1937. In addition the engine *"Silver Link"* created a world's record by averaging 100 m.p.h. for 43 consecutive miles on the test run with *"The Silver Jubilee"* train in 1935.

Unusual Railway Station Design

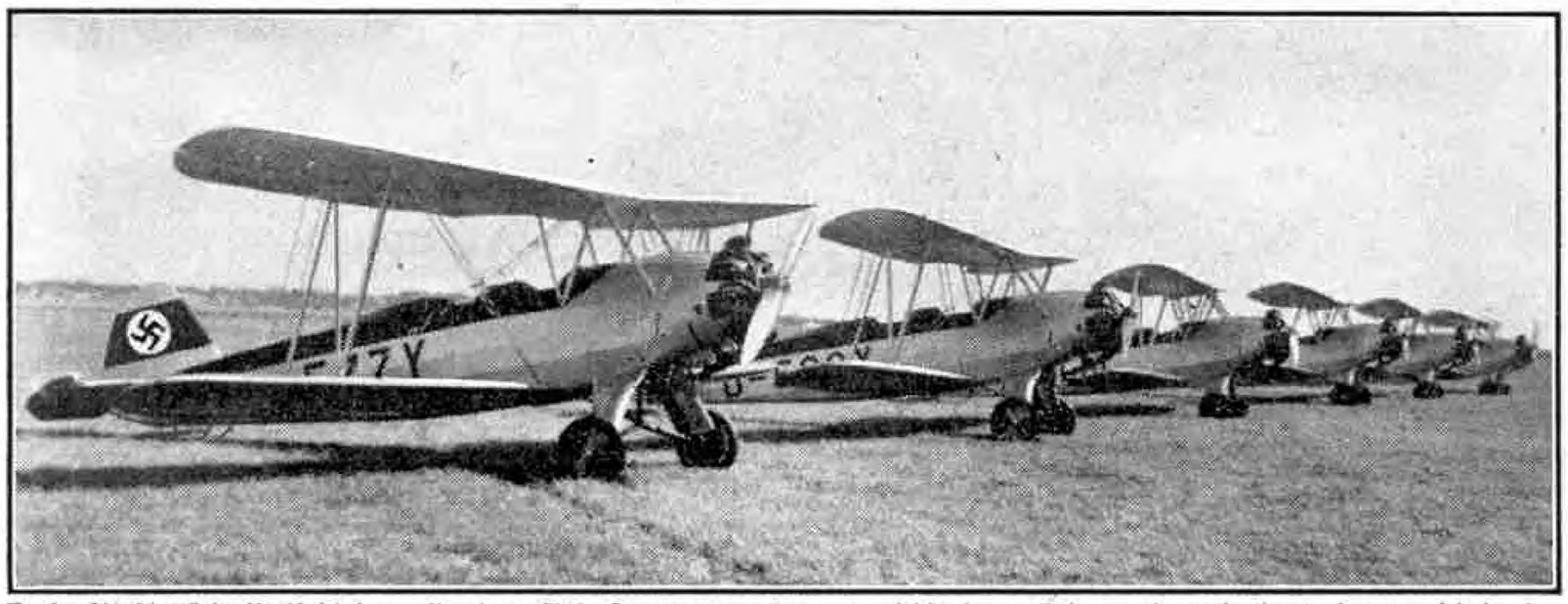
The upper illustration on this page shows the exterior of the station building at Malden Manor, on the new S.R. line between Chessington and Motspur Park to which reference was made in last month's *"M.M."* The platforms are on the embankment on the right, and the conspicuous tower accommodates a goods lift.

German Training Aircraft

Some Contrasting Focke-Wulf Types

TRAINING aircraft do not need to be capable of very high speed or of carrying heavy loads, but they have to be adaptable to many different branches of air training in addition to mere flying instruction. These branches include instrument flying, radio, direction finding, aerobatics and air photography, and in the case of trainers for military use other special branches such as reconnaissance, bomb-aiming, and aerial fighting. The three aeroplanes illustrated this month are typical German training types, and are produced by the Focke-Wulf Company, of Bremen.

The Fw 44 "Stieglitz," shown in the upper illustration on this page, has proved one of the most successful Focke-Wulf types of recent years. It is included in the varied training aircraft of the Swedish Air Force, and licenses for its manufacture have been granted to that country, Brazil, and the Argentine Republic. The "Stieglitz" is a most useful machine for preliminary flying training, as it retains its stability in the air even when severely mishandled by a new and perhaps nervous pupil. Although in such circumstances the joystick may be pulled over to the full extent, the aeroplane is still manœuvrable by the balancing flap and side rudder.

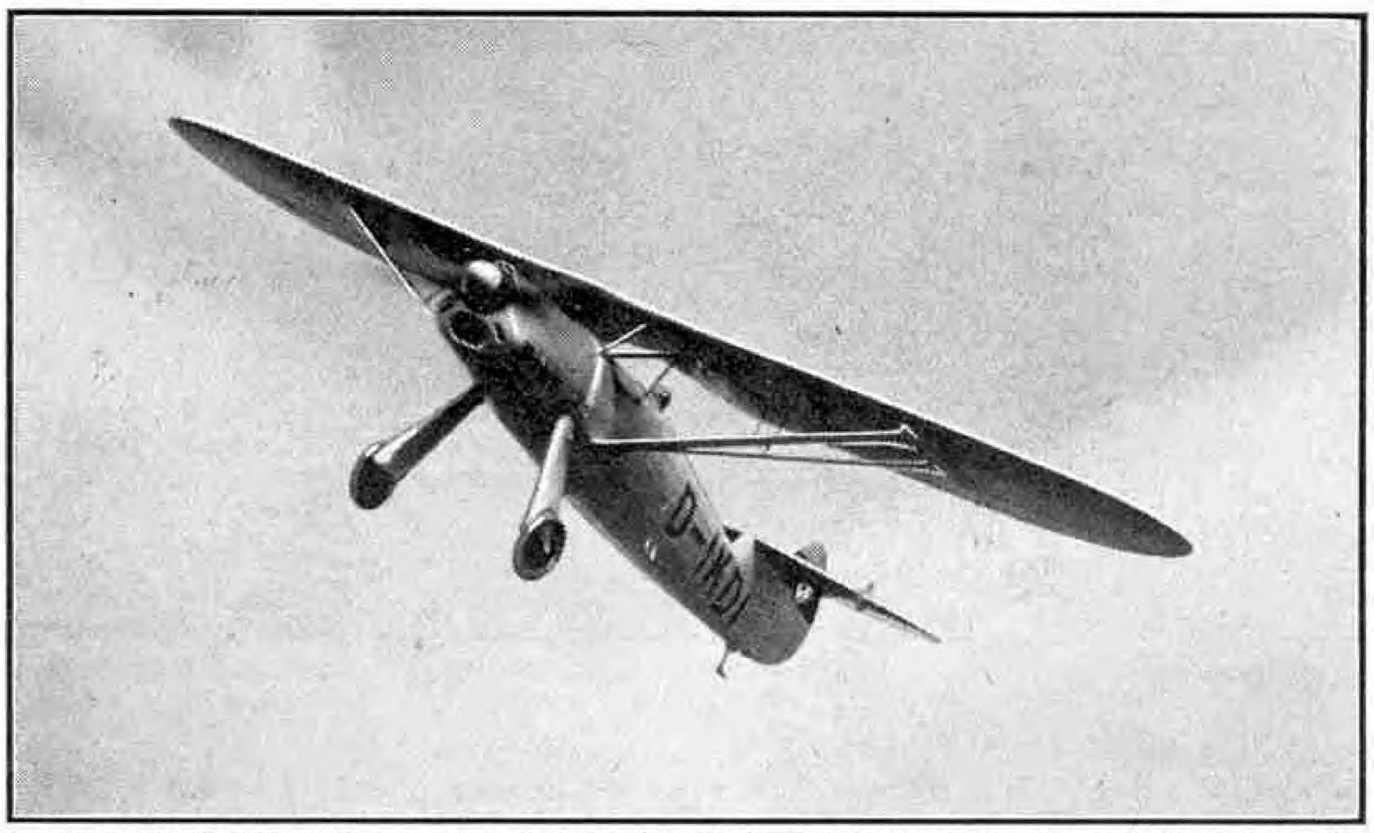


Focke-Wulf "Stieglitz" biplanes lined up. This German type has proved ideal as a flying and aerobatics trainer, and it is also very popular abroad as a sporting and touring aeroplane. The illustrations to this article are by courtesy of Focke-Wulf Flugzeugbau A.-G., Bremen.

It is equally efficient for the more advanced training that includes aerobatics, and the fine climbing power of the aeroplane enables the pilot to quickly gain the necessary altitude for security in carrying out the training exercises. Looping the loop, turning, rolling, and all flying of trick figures can be done very easily with this machine. In looping the loop the aeroplane is flown from the horizontal flight with full throttle and gains height in about 8 sec., without showing any tendency to go off its course; and in upside-down flying the adjustable stabilising fin of the tail unit enables the pilot to keep the aeroplane inverted, to fly curves in this position, and to change out of inverted flight into other aerobatic manœuvres.

The "Stieglitz" also makes an excellent light touring or sporting aeroplane, and in this capacity it is popular abroad. One of these aircraft was flown by Herr Gerbrecht, a well-known German airman, in the Manx Air Derby held in the Isle of Man on 7th June last, and was the second to complete the course. When the "Stieglitz" is used for private touring the luggage is stowed behind the pilot's seat, where there is ample room for it.

It is the only biplane among the current types of Focke-Wulf aircraft. The wings are of wood and are heavily staggered, and the lower one is so far back that the fixed undercarriage legs, enclosed in deep streamlined fairings, are in front of it. The fuselage is polygon-shaped in section and is a welded tubular steel structure, the top side of which is covered with light metal sheeting and the remainder with fabric. The two open cockpits are arranged one behind the other, and the dual control stick and rudder bar in the front cockpit are connected with the control stick and pedals in the rear one.



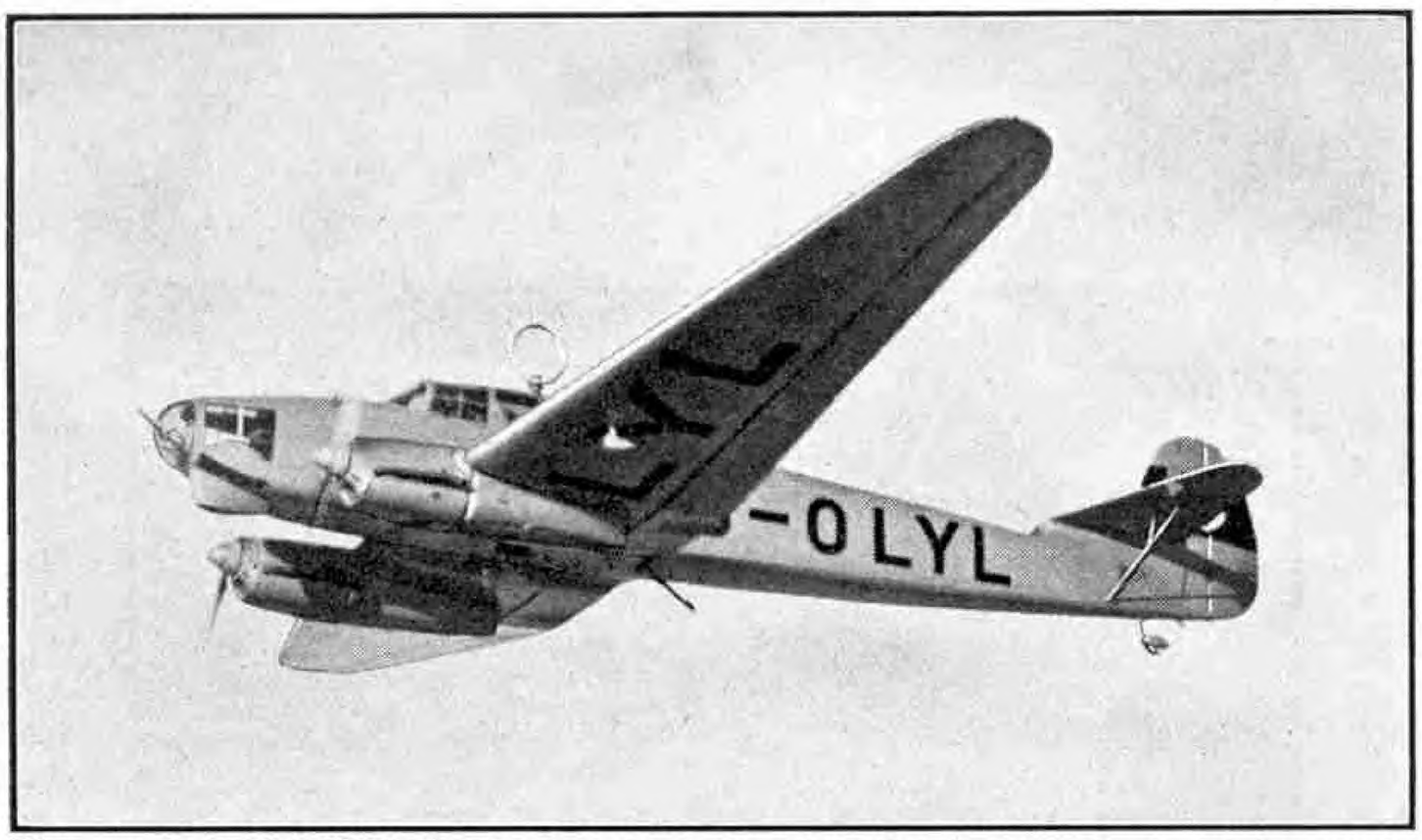
The Focke-Wulf "Stösser," shown here in flight, is a single-seater parasol monoplane, designed for radio, bombing, and gunnery training.

The standard engine equipment is a 150 h.p. Siemens Sh 14a radial air-cooled engine, which gives the aeroplane a top speed of 118.5 m.p.h. and a cruising speed of 108 m.p.h. The service ceiling is 14,450 ft. and the range 336 miles.

The high wing monoplane shown in the lower illustration on this page is the Fw 56 "Stösser" single-seater. It is designed for radio, gunnery, and bombing training, but is equally adaptable for service with a home defence

squadron; for either purpose it can be equipped as required with two machine guns or with one machine gun and bomb releasing gear. Its usefulness is not limited to military aviation, and by the provision of larger fuel tanks it makes an excellent fast touring aeroplane for the private owner requiring a machine solely for himself.

The "Stösser" is a parasol type monoplane, in which the wing is above the fuselage instead of being attached directly to it. This wing is of wood, built in two sections joined together on the centre line of the aeroplane, and is supported by N-shaped and inclined Vee struts, the lower ends of which are attached to the fuselage. The centre portion of the trailing edge of the wing is cut away to give overhead clearance to the cockpit. The welded steel fuselage is oval in section and is covered with Elektron sheeting as far as the cockpit, and from there to the stern with fabric. The "Stösser" is fitted with a 240 h.p. "Argus" inverted Vee, air-cooled engine, and is capable of a top speed of 172.6 m.p.h. It has a range at cruising speed of 286 miles, and the greatest height to which it can climb is 20,336 ft.



When the Focke-Wulf "Weihe" trainer is in the air the undercarriage is completely retracted into recesses that are then closed by hinged doors. The above photograph shows how this helps to give effective streamline form to the aeroplane in flight.

The Fw 58 "Weihe" illustrated on this page is a larger monoplane than the "Stösser," and shows more definitely the trend towards streamlining that has been a feature of aircraft design during recent years. It can rightly be described as a "general purpose" trainer, as bombing, machine gun, blind flying, and radio instruction, and the transitional training of pilots from single to twin-engined aircraft, have been specially catered for by its designers. An interesting feature is that the conical metal-covered nose of the fuselage can be detached and replaced by a gun turret large enough to accommodate instructor and pupil for machine gun and bomb-aiming instruction. The enclosed cockpit for the pilot is about in line with the leading edge of the wing and has side-by-side seating for two; and all the instruments can be seen easily from both seats. When the aeroplane is required for blind flying and radio training, detachable dual control can be installed at very short notice. Behind the pilot's cockpit is the wireless compartment, and farther back there is another compartment used when bombing instruction is given, and containing a bombing trap, with sights. Above this compartment is the rear gun position.



A closer view of the "Weihe," showing the gun turret in the nose of the fuselage. The loop aerial for wireless direction-finding can be seen on the roof of the enclosed cockpit.

The "Weihe" is a low wing braced monoplane of all-metal construction. The wing is built in three sections, and the centre section is braced by two long inclined struts, one on each side of, and attached to, the fuselage. The fuselage is of rectangular section, and in accordance with Focke-Wulf practice is of welded tubular steel, with a covering of wood and fabric. The tail unit is rather unusual as can be seen from the upper illustration. The adjustable tail-plane is mounted in advance of the fin, which is an integral part of the fuselage. Both elevators and rudder have controllable trimming tabs. The framework of the tail unit is of duralumin, and the covering is fabric. When the aeroplane is in flight the legs and wheels of the undercarriage are completely withdrawn into recesses in the underside of the engine nacelles, and the apertures closed by hinged doors.

The two engines of the "Weihe" are of the same type as those fitted in the "Stösser," and are mounted in the leading edge of the wing, one on each side of the fuselage. They give the aeroplane a top speed of 158 m.p.h. and a cruising speed of 148 m.p.h. Sufficient fuel can be carried for flying 208 miles. The aeroplane can climb to a height of 17,715 ft., and with only one engine running can maintain a height of 6,560 ft.

In the commercial aircraft field the Focke-Wulf Company have noted the growing demand for multi-engined air liners seating 20 or more passengers. Their latest production is the Fw 200 "Condor," a beautifully streamlined four-engined air liner. It is a low wing monoplane of all-metal construction, and the cabins seat a total of 26 passengers. The Deutsche Luft Hansa are acquiring seven of these aircraft, which will be equipped with automatic pilots, and will be used chiefly on the company's Berlin-London air service. The "Condor" will be fully described and illustrated in a later issue.

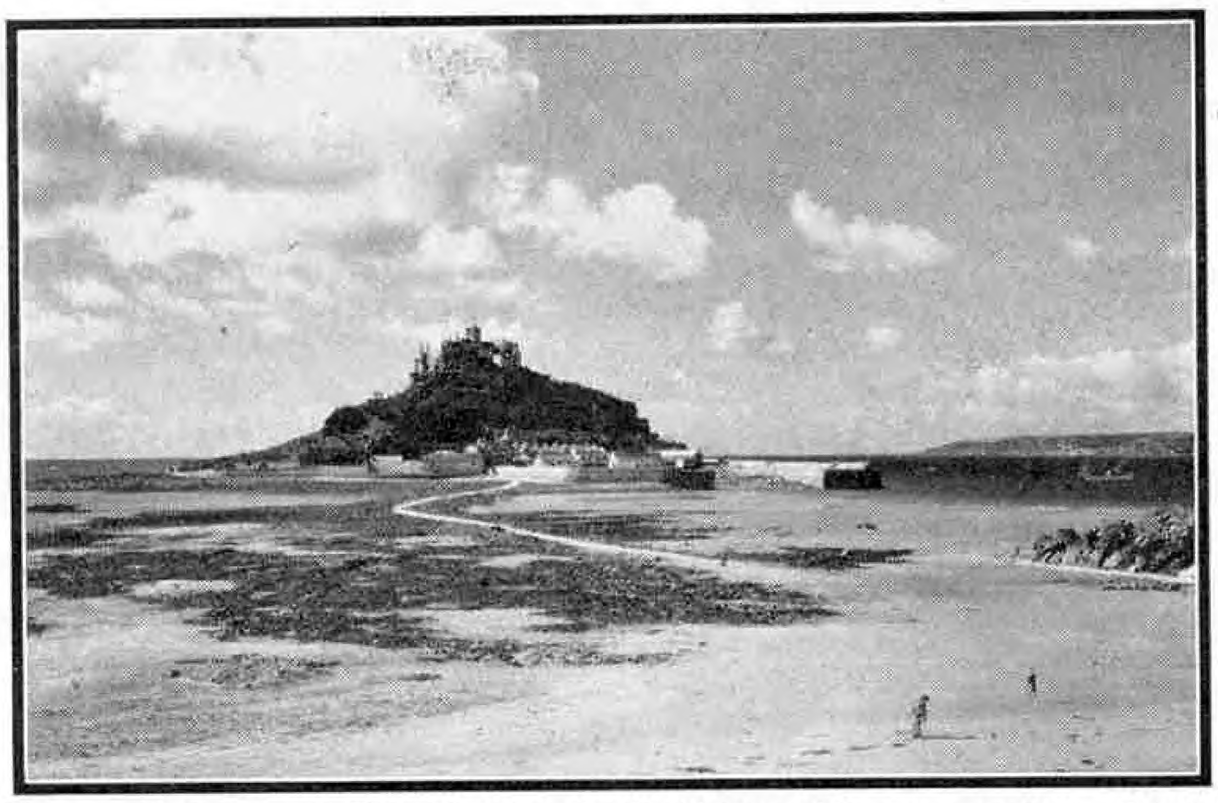
Engineering Romance in Cornwall

Mines Worked in Prehistoric Times

By D. S. Barrie

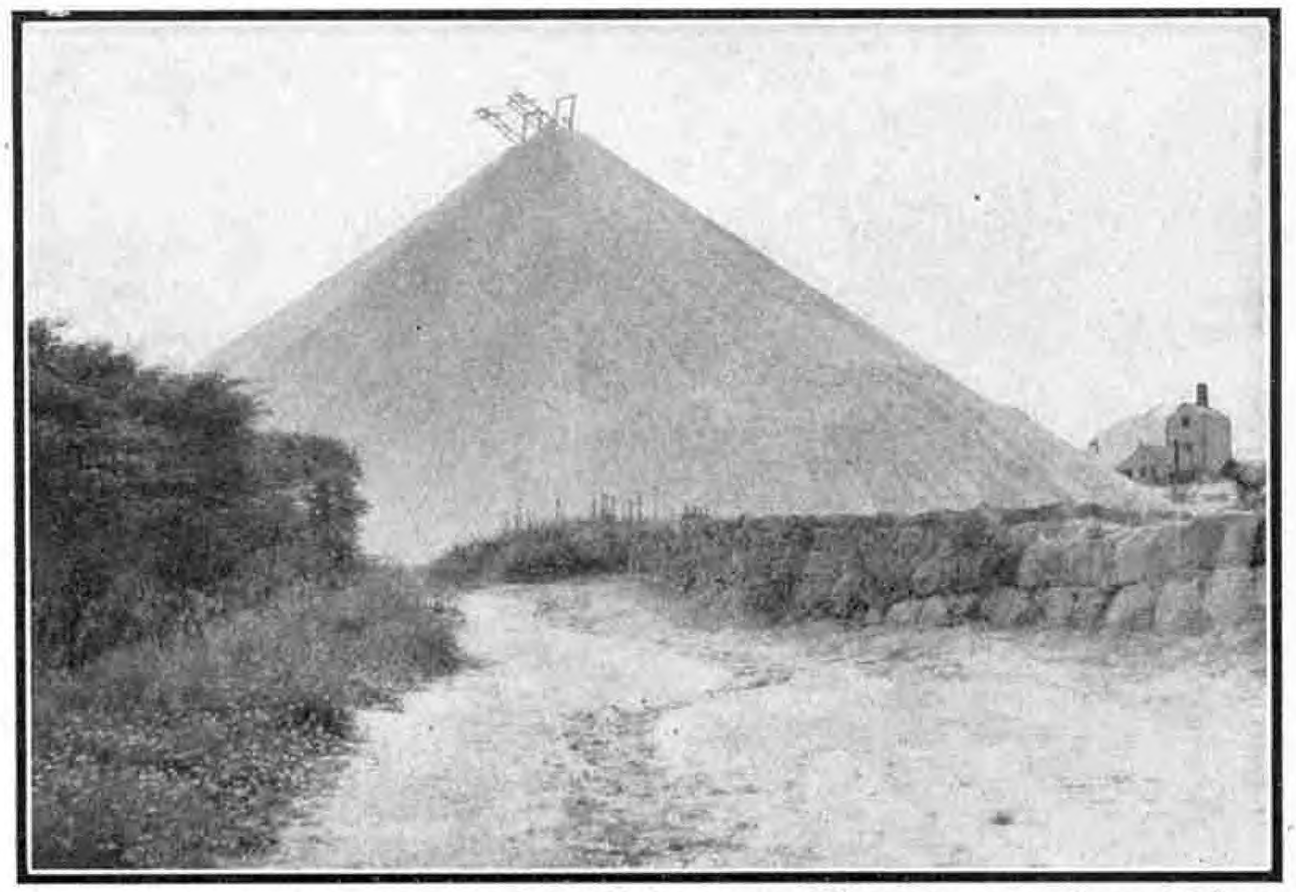
CORNWALL, beloved of thousands of holiday folk for its golden sands, its rolling hills and moors, or its rugged cliffs with the white gulls wheeling above pounding surf, has yet another side, that appeals to the student of industrial history, mining or transport.

To the mechanically-minded, the name of Cornwall conjures up visions of the delicate tracery of timber viaducts carrying the steel track high over valley and ravine; of the tin miners sweating down in the undersea galleries with the waves booming not far above their heads; of iron foundries and inclines; of the white pyramids that denote the china clay workings; or of tall lighthouses with the restless ocean drumming its ceaseless menace at their base.



St. Michael's Mount, near Penzance, where the Phœnicians and Romans came to buy Cornish tin. The photographs to this article are reproduced by courtesy of the G.W.R.

It is sad that so much of Cornwall's industrial glory belongs to the past, for there are few parts of the country where industry has left fewer scars or has done so little to mar the beauties of a region richly endowed by nature and tradition. Cornwall in the past has not only been a centre of great engineering activities; it has also produced famous engineers. Among them was Richard Trevithick, the father of the steam locomotive, whose experiments were made a quarter of a century before the appearance of George Stephenson's "*Rocket*." Trevithick's earliest locomotive was built in Cornwall and ran on Cornish roads, but the inventor's efforts were not rewarded with the success that came later to others.



A vast china clay dump at Goonbarrow, Cornwall. Some parts of the county produce the world's finest china clay, and nearly a million tons are sent out in a year.

It was in the field of mining, however, that the success of Cornishmen was more tangible, and at the height of its prosperity of tin and copper production the men of the Duchy not only raised their native industry to tremendous heights of wealth and output, but also fared forth into the remotest corners of the world to prospect and develop the hidden riches of the Earth.

In the story of its mines lies at once the great romance and tragedy of Cornwall. Its tin mines are among the oldest in the world, for there is definite evidence that tin was worked here some two centuries before Christ, while the Phœnicians and the Romans in their turn came in their long ships to what is now St. Michael's Mount near Penzance, braving the perils of the long sea voyage and dangerous coast to barter with the natives for their crudely purified tin. Copper, however, was not first raised on a profitable basis until about 1700.

The Cornish tin mines enjoyed their heyday during the middle and latter part of last century, when the maximum yearly output was about 10,000 tons. By 1890 it was down to 4,000 tons, but following a brief war-time recovery, which yielded nearly 7,000 tons in one year, and another in 1924 when over 1,700 tons were won, the industry steadily declined, until to-day the Cornish proportion of the world's tin output is infinitesimal. There are several reasons for this sad state of affairs. Foreign competition is one, international price-control another. Moreover, most of the shallow workings where tin was won by "streaming" with water have become exhausted, while deep-level mines have in many cases become flooded and are incapable of being reopened.

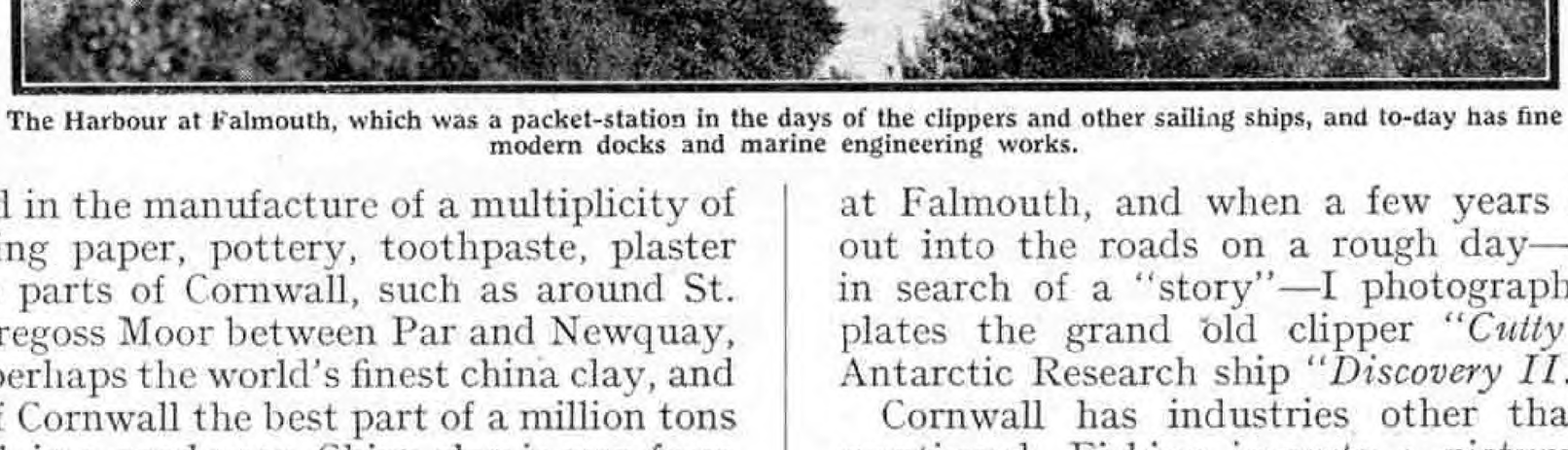
Although the mine chimneys dot practically the whole of the county, West Cornwall was the great centre of the tinning industry, the largest concentrations being found in the Redruth-Camborne district, to which in later years the active mines have been mainly confined. Around Redruth and Camborne some of the derelict mines whose extinction has been comparatively recent are well worth a visit, if one cannot be arranged to a working mine.

At some of the old mines the explorer may still find in

position the winding-engines and gear now idle, although in most cases this equipment has been removed. Apart from the workings where the tin was won by "streaming" the soil almost at the surface, the mines generally employed steam power for bringing the slag to the surface. Many interesting specimens of beam engines were to be found, while the "Cornish boiler" is well known in engineering.

If the memorial of Cornwall's once premier industry is to be found in the tottering chimneys and roofless engine-houses, at any rate the story of another important Cornish industry is considerably more cheerful. China clay is used in the manufacture of a multiplicity of products, including paper, pottery, toothpaste, plaster and soaps. Some parts of Cornwall, such as around St. Austell and on Tregoss Moor between Par and Newquay, produce what is perhaps the world's finest china clay, and from the whole of Cornwall the best part of a million tons of it are sent forth in a good year. China clay is won from the sandy soil in which it is found by persistent and intensive "streaming" and screening, every particle of sand and foreign matter being washed out of it before it is allowed to settle, preparatory to being taken to the kilns for drying, a process which may take several days. Some of the deepest china clay pits are 200 ft. deep, while the pyramid-like cones of whitish spoil, representing the residue after the clay has been won, form a landmark for miles around Roche or Luxulyan.

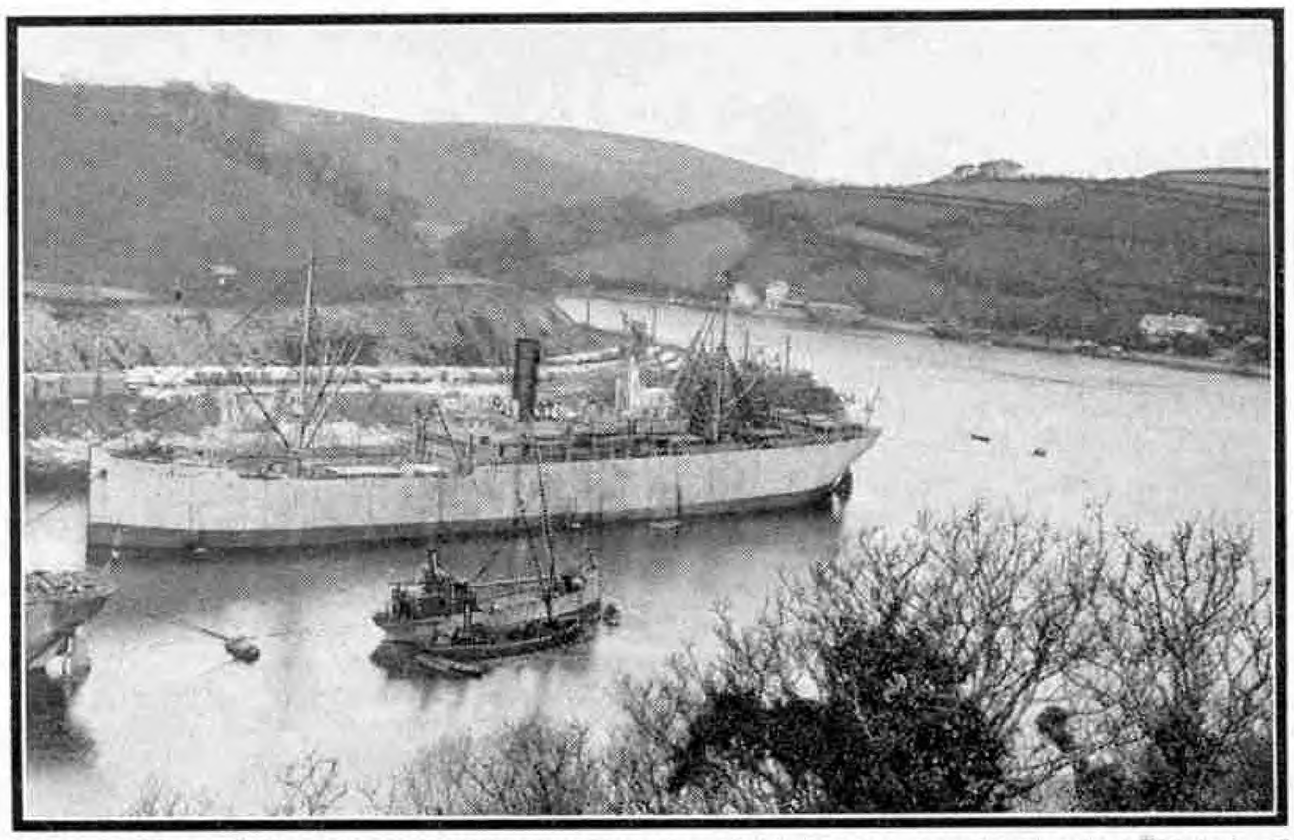
The traveller over the steeply-graded branch of the Great Western Railway from Par, on the Plymouth-Penzance main line, to the popular North Cornwall holiday resort of Newquay, cannot fail to mark these giant pyramids, the kilns and other works adjacent to them, and the sheeted railway wagons in which the clay is conveyed to Fowey for shipment. Fowey, the most important clay-shipping port, has a most beautiful situation on the river of the same name, and a gallant history, too, for it supplied vessels both to carry the knights to the Crusades and to fight under Drake against the Armada. Now its activities are more peaceful but none the less intensive, for its electric conveyors by which the clay is shipped, and which have been installed in recent years by the G.W.R., have a capacity of 240 tons each per hour and the port as a whole can load well over 4,000 tons, of china clay in a single working day.



The Harbour at Falmouth, which was a packet-station in the days of the clippers and other sailing ships, and to-day has fine modern docks and marine engineering works.

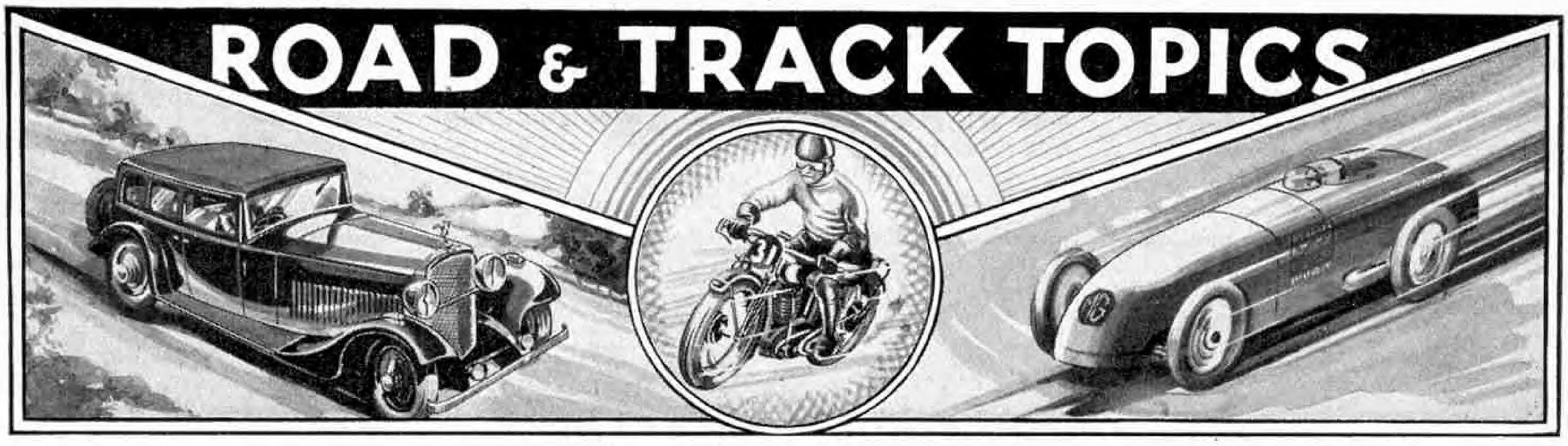
Just as Fowey deserves a visit, so too does Falmouth, not many miles farther west along this lovely, sub-tropical coast. Falmouth's fame as a packet-station belongs to the past, but it has fine modern docks and marine engineering works, the largest of its several graving-docks being capable of accommodating a ship of about 25,000 tons gross. Ships from all the world are seen at Falmouth, and when a few years back I ploughed out into the roads on a rough day—a newspaperman in search of a "story"—I photographed on successive plates the grand old clipper *"Cutty Sark"* and the Antarctic Research ship *"Discovery II."*

Cornwall has industries other than those I have mentioned. Fishing imparts a picturesque appearance to every Cornish port and cove, but its greatest centre is Newlyn, beloved of artists. Spring flowers bloom in luxury and abundance in the West, well forward of other parts of the country on account of the favourable climate; broccoli and potatoes are other local industries which have been intensively developed since the decline of mining dealt such a terrible blow to Cornwall's economic prosperity. Cornish quarries, too, yield some fine stone—and after all, china clay is only granite in an intensely powdered form.



Jetties at Fowey, Cornwall's most important port for shipping china clay. Well over 4,000 tons of clay can be loaded there in a single day.

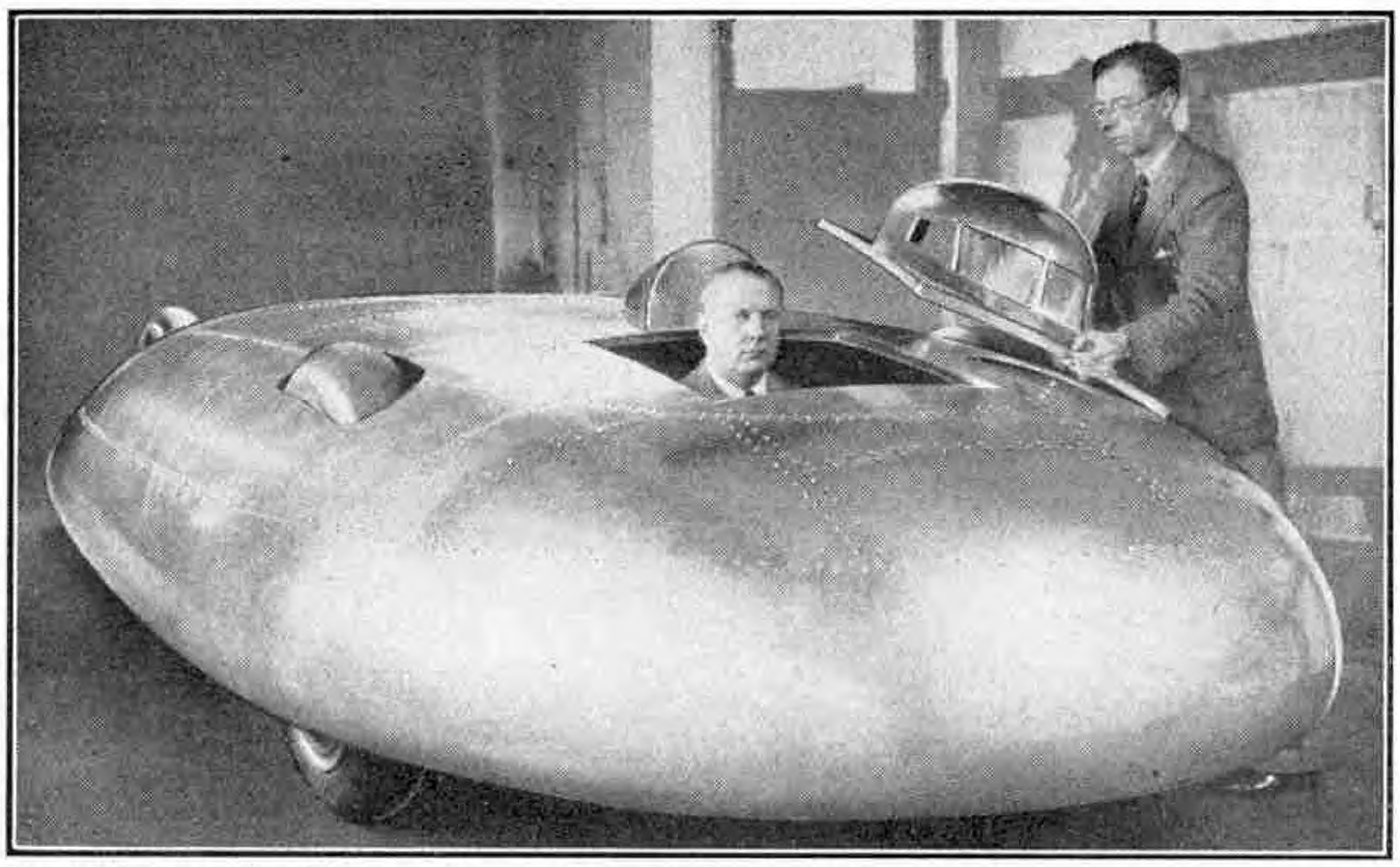
Cornish granite has been used for building many famous structures, including Waterloo and WestminsterBridges and portions of London's docks. The Cornish quarries with the most famous past are probably those at Luxulyan, near Par, and at the Cheesewring, a huge granite hill above Liskeard. All around the Cheesewring, on which stone was still being quarried when I was there a year or two ago, are long-derelict mines, served in their heyday by a railway, an extension of the present branch from Liskeard to Looe, whose track itself is now rail-less and forlorn. Cornwall's railways, however, form a fascinating, but separate, story.



The "*Railton*" Speed Car

According to present plans the attack on the world land speed record by John Cobb in his new "*Railton*" car will be made this month on Bonneville Salt Flats, Utah. The "*Railton*" has been specially designed for this attempt and possesses many unique features.

As will be seen from the illustration on this page the car has a very unusual appearance, due to the complete streamlining of its aluminium alloy body. In order to reduce resistance to the air as much as possible, the entire mechanism, with the wheels and tyres, are enclosed. The smooth contour of the body is broken only by the cover over the driver's cockpit, which is ahead of the front axle, and the four covers over the tops of the tyres. The body is so mounted that it can be detached and lifted from the chassis by six mechanics in a few minutes. A noticeable point in the design is the absence of the tail fin favoured in other high speed cars, such as Captain Eyston's "*Thunderbolt*" and Sir Malcolm Campbell's "*Bluebird*."



The "Railton" car in which John Cobb hopes to create a new world land speed record The picture shows Reid Railton, designer of the car, fitting the cockpit cover over the head of John Cobb.

The frame consists of a single central steel girder, and on each side of this, near the centre of the car, is a 12-cylinder Napier Lion supercharged engine. Each engine develops 1,250 h.p., and is cooled by water circulated from a 75-gallon tank, in which pieces of ice are placed before each run. This system of cooling avoids the use of a radiator, which would spoil the streamlining of the body.

Each engine with its transmission works independently of the other, one driving the front wheels and the other the rear ones. Separate gear-boxes are provided, and are so arranged that gear is changed in both boxes by moving one lever. The throttles of the engines also are interconnected, and the brake pedal, in addition to operating hydraulically two contracting band brakes on the gear-boxes, can be made also to raise a flap at the back of the body, which serves as an air-brake.

French Victory in Le Mans 24-Hour Race

The Le Mans Grand Prix d'Endurance, or 24-hour Race, the famous gruelling day and night race, was won this year for the second time in succession by a French car driven by Frenchmen. The victors were Chaboud and Tremoulet, who alternated at the wheel of a Delahaye, and in the 24 hours they travelled a total distance of approximately 1,976 miles, at the average speed of 82.5 m.p.h. Another Delahaye, driven by Serraud and Cabantous, was second, with a distance covered of 1,959 miles. A Talbot, driven by Prenant and Morel, was third, having travelled a distance of approximately 1,839 miles.

In the early stages of the race there was a fierce struggle between the 8-cylinder supercharged Alfa-Romeo driven by Sommer and Biondetti and two big supercharged Delahayes. The Alfa-Romeo won this contest, but eventually had to retire after losing the tread of one of the front tyres. This left two smaller unsupercharged Delahayes in command, and they eventually came in first and second.

Seven cars driven by British competitors took part in the event, but of these only two finished. They were an H.R.G. driven by P. Clark and M. Chambers, who travelled about 1,431 miles, and a Morgan driven by Miss P. M. Fawcett and G. White. Two other British cars with overseas drivers also finished. These were a Singer and an M.G., and the Singer was the winning car in the 1,100 c.c. class.

Thrilling Racing in the Isle of Man

This year's Tourist Trophy motor cycle races in the Isle of Man proved the most exciting in the history of these famous events, and provided the fastest and most thrilling driving ever seen over the 264 miles of winding mountainous roads that make up the "T.T." course.

Several new speed records were created. In winning the Junior event S. Woods, riding a Velocette, covered the distance at an average speed of 84.08 m.p.h., and in the third lap averaged 85.30 m.p.h., beating the existing lap record by two seconds. Second home in this race was E. A. Mellors, also on a Velocette, and third place was obtained by F. L. Frith, who drove a Norton.

The race for the Lightweight Trophy resulted in a sensational victory for Ewald Kluge, a German driver, who on his 248 c.c. D.K.W. completed the course at an average speed of 78.48 m.p.h.! This speed was higher than the previous record for a single lap, and at the finish Kluge held a lead of 11 min. 9 sec., the greatest margin by which the race has been won for the last 10 years. S. Wood on an Excelsior finished second, his average speed being 74.38 m.p.h., and H. G. Tyrrell Smith, also on an Excelsior, was third with an average speed of 73.62 m.p.h.

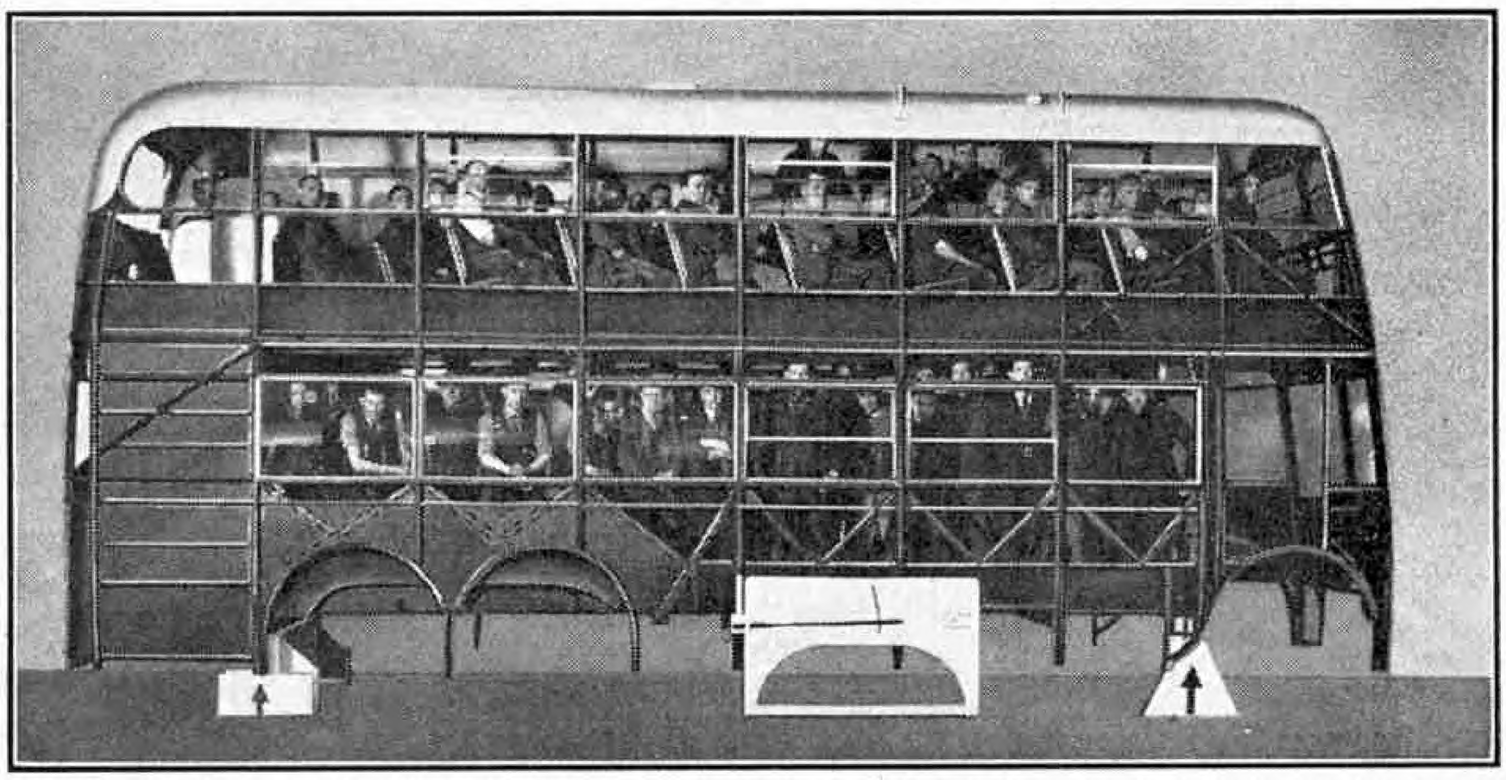
It was expected that the German B.M.W. machines would make a strong bid to capture the laurels in the Senior event. The German challenge faded out soon after the start, however, for one of the two B.M.W.'s retired with plug trouble in the first lap, while the other could do no better than obtain fifth place. The race was the fastest Senior Tourist Trophy ever ridden, and was won by H. L. Daniell with an average speed of 89.11 m.p.h. on a Norton after a thrilling battle with Woods, riding a Velocette, and Frith on a second Norton. In the last lap Daniell set up a new record of 91 m.p.h., and Woods also put in a final burst of speed in his last lap to beat Frith by the margin of $1\frac{3}{5}$ seconds!

Of the 25 machines that started in the Senior race, 14 completed the course. Among these nine were Nortons, two of which gained first and third places respectively. It is interesting to note that the last finishing machine accomplished the seven laps of the course at an average speed of nearly 75 m.p.h.!

Testing a Leyland Trolley-Bus

The illustration on this page shows an interesting experiment that was carried out recently by Leyland Motors Ltd., on one of their all-metal double-deck bus bodies. A 70-seater London Transport trolley-bus body, stripped of its panels, was placed on supports at the front and rear, and an indicator to show how much the frame bent when loaded was fitted to the middle of the body, which was entirely unsupported.

When 70 workmen sat in the bus the indicator showed a bend of only $\frac{1}{16}$ in. More men then entered the bus to represent a passenger overload, but their weight only increased the downward bend to 3/32 in., and even when the men stamped about in both saloons the deflection never exceeded an eighth of an inch. The longitudinal members of the body returned to normal after it had been unloaded.



A Leyland trolley-bus undergoing a bending test at the makers' works. In the centre is the indicator showing the small extent of the bending under load. Photograph by courtesy of Leyland Motors Ltd., Leyland.

New R.A.C. Tourist Trophy Rules

This year's R.A.C. Tourist Trophy Race, which will take place at Donington Park, near Derby, on 3rd September, will be run under new regulations framed by the R.A.C. with the object of assisting in the production of improved modern sports cars.

The race is now open to specially-built experimental cars not ordinarily in production, although the type of machine eligible for entry is still kept closely related to the sports or touring car. Cars with supercharged engines are banned, as are those built to the Grand Prix formula, and only one carburettor is allowed for each pair of cylinders in the engine. Fuel that can be obtained from a public pump in the ordinary manner must be used, and sufficient must be carried to take the car through the entire race, which is run over 100 laps of the Donington circuit, a total distance of about 312 miles. The ratio of engine capacity to wheelbase also is restricted. For example, a very short car with a very large engine is not eligible.

Competing cars will be grouped into classes according to the capacities of their engines. The maximum capacities in these classes are 1,100 c.c., 1,500 c.c., 2,000 c.c., and 3,000 c.c., and there is a class for cars with engines of more than 3,000 c.c. capacity. Prizes of £200 and £100 will be awarded for the first and second cars respectively in each class, and the winner of the Tourist Trophy itself will be decided on handicap.

The new regulations have aroused considerable interest, and there appears to be every possibility that this year's entry will be one of the most representative that the R.A.C. has yet received for this famous event. It is expected that teams of Darracqs, Delahayes, B.M.W.s and Fiats will take part, and individual entries may include Bentley, Alfa-Romeo, Delahaye, Darracq, M.G., Riley, H.R.G., and Morgan cars in addition to several other well-known makes.

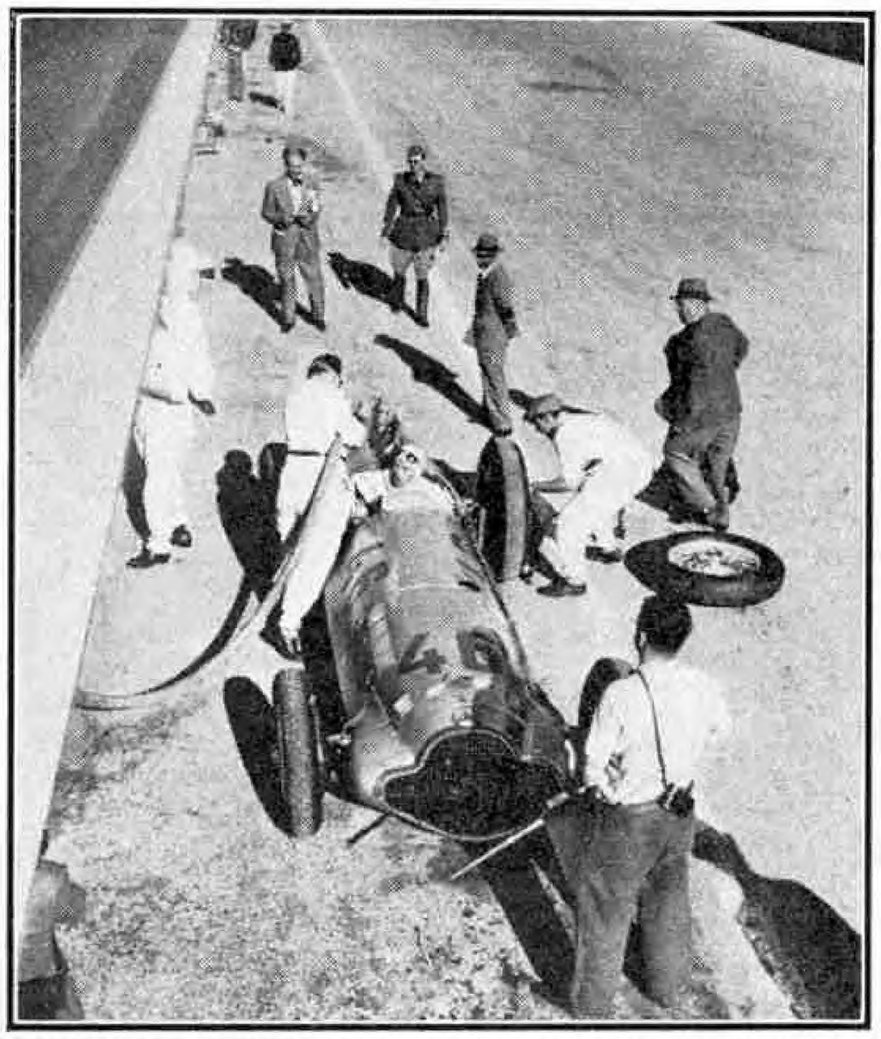
A Record Breaking M.G. Car

Construction of a new M.G. car, with which it is hoped to establish new records, is now under way. The car is beautifully streamlined, the body being sufficiently wide to enclose the wheels, and is built as low as possible and wide in comparison with its length. The engine itself is the most outstanding feature; its capacity is 1,100 c.c., and it is specially developed from the six-cylinder M.G. Magnette unit.

Mercedes Victory in the Tripoli Grand Prix

Mercedes cars made a clean sweep of the first three positions in this year's Tripoli Grand Prix. The winner was Hermann Lang, who also won last year, but his speed on this occasion was 127.5 m.p.h., seven miles below last year's record of 134.4 m.p.h. The lower illustration on this page shows Lang seated in his car during a pit stop, with pit attendants filling up the tank and changing the tyres.

The driver of the second car was M. von Brauchitsch, and R. Caracciola was third. The only three other cars to finish were an Alfa-Romeo, a Maserati and an unsupercharged Delahaye, in that order.



A Mercedes car, with H. Lang at the wheel, having its petrol tank refilled and tyres changed during this year's Tripoli Grand Prix. Lang won at an average speed of 127.5 m.p.h. Photograph by courtesy of Daimler-Benz A.G., Stuttgart.

Fane's Shelsley Record Still Unbroken

None of the competitors who took part in the first Shelsley Walsh Hill Climb this year succeeded in lowering the present record of 38.77 sec., standing to the credit of A. F. P. Fane and his Frazer-Nash. Raymond Mays, a previous holder of the record, very nearly succeeded in his second run, however, when he drove a 2-litre E.R.A. up the hill in 38.90 sec., only a fraction of a second longer than Fane's time. Unfortunately his car hit the inside bank at one point and was flung across the road. This incident undoubtedly cost him the record.

The best time for a woman driver was 46.08 sec., made by Mrs. K. Petre, the present holder of the woman's record, which stands at 43.78 sec. Another woman competitor was Miss Amy Johnson, the airwoman. Her time was 49.57 sec., a very creditable performance for her first appearance at Shelsley.

An outstanding feature of the event was a series of amazing runs put up by several pre-war cars. Among these a 1908 Itala driven by C. Clutton was timed at 50.98 sec., while A. S. Neal's 1910 Fiat ascended in 47.96 sec. An Opel built in 1913, and once driven by the late Sir Henry Segrave, made the ascent in 51.17 sec.

New Engine Designs for the Grand Prix

Racing car designers are tending more and more to employ multi-cylinder engines, and models of great interest have been evolved by several well-known racing car constructors for entry in this year's Grand Prix events. For instance, the Maserati cars are powered with straight-eight 3-litre engines in which the cylinders are arranged in two blocks of four. The engines are fitted with twin superchargers mounted one above the other in front of the engine.

Even more interesting is the Mercedes-Benz engine, which has 12 cylinders arranged in V formation. This engine also is fitted with twin superchargers, and an interesting feature is the use of four camshafts. In spite of the size and form of the engine the Mercedes-Benz cars have characteristic low streamlined bonnets.

The Alfa-Romeo firm also have been experimenting with V-engines, but of 16 cylinders, fitted with four superchargers and four overhead camshafts. The superchargers are mounted between the cylinder blocks and the whole unit presents a bulky appearance.

The Auto-Union cars will be fitted with1 V6- cylinder engines similar to those used last year. The E.R.A. cars are the only British racing cars designed for entry in the Grand Prix events. These are fitted with six-cylinder engines.



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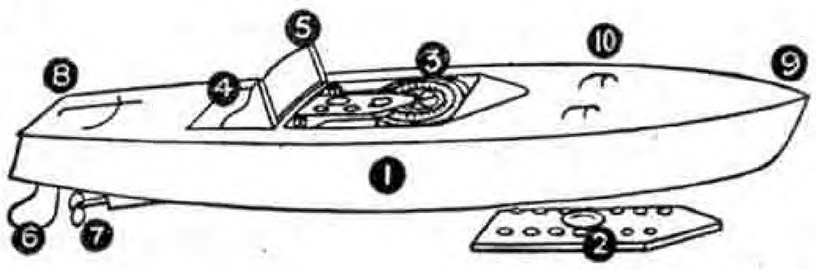
Hornby Speed Boats and Racers are the finest model craft of their kind in the world—beautifully made a
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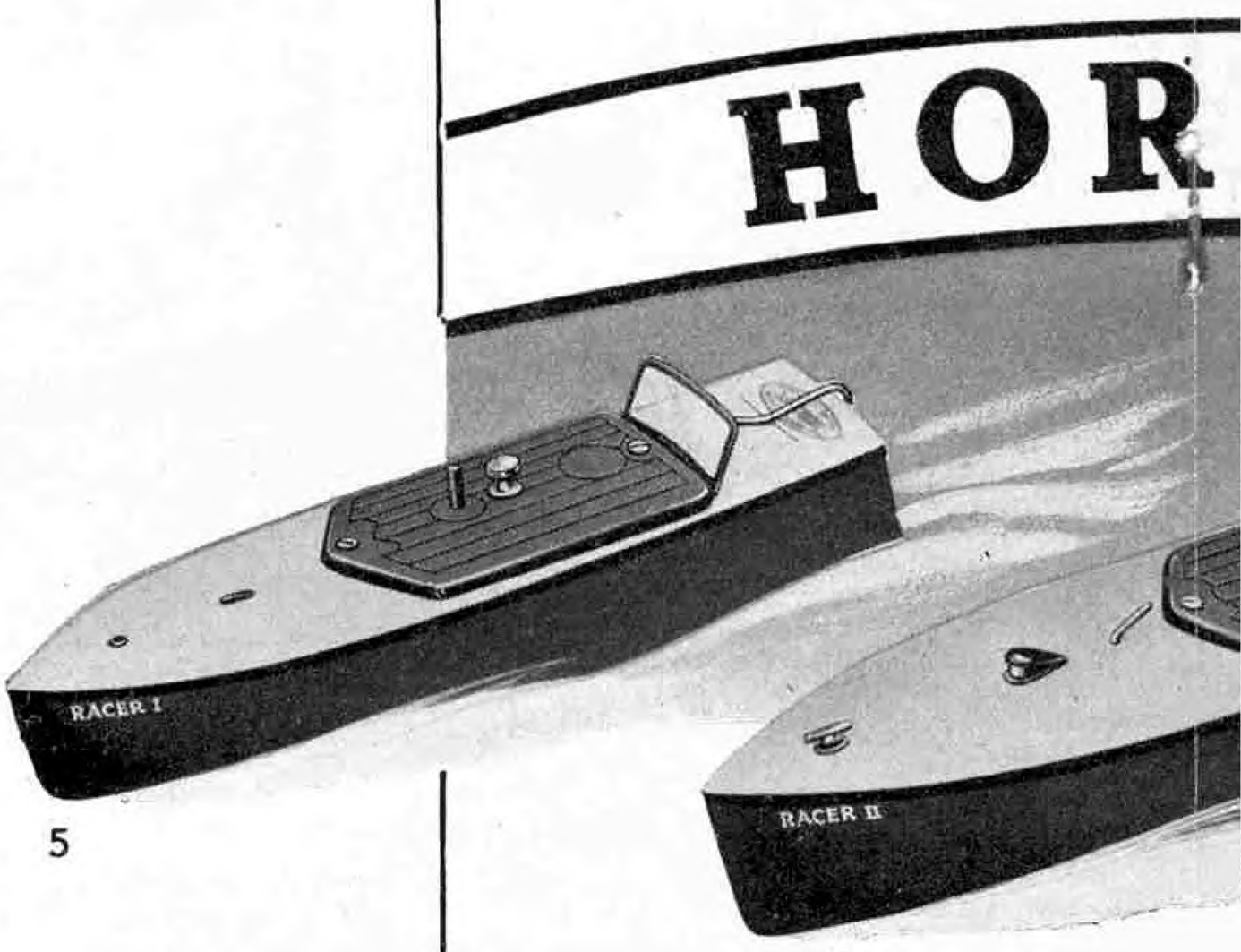
Your local dealer will show you all the models—from the out-and-out racers to the smart limousines. Wh
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Red Sails on London River

Sailing Barges of the Thames and Medway

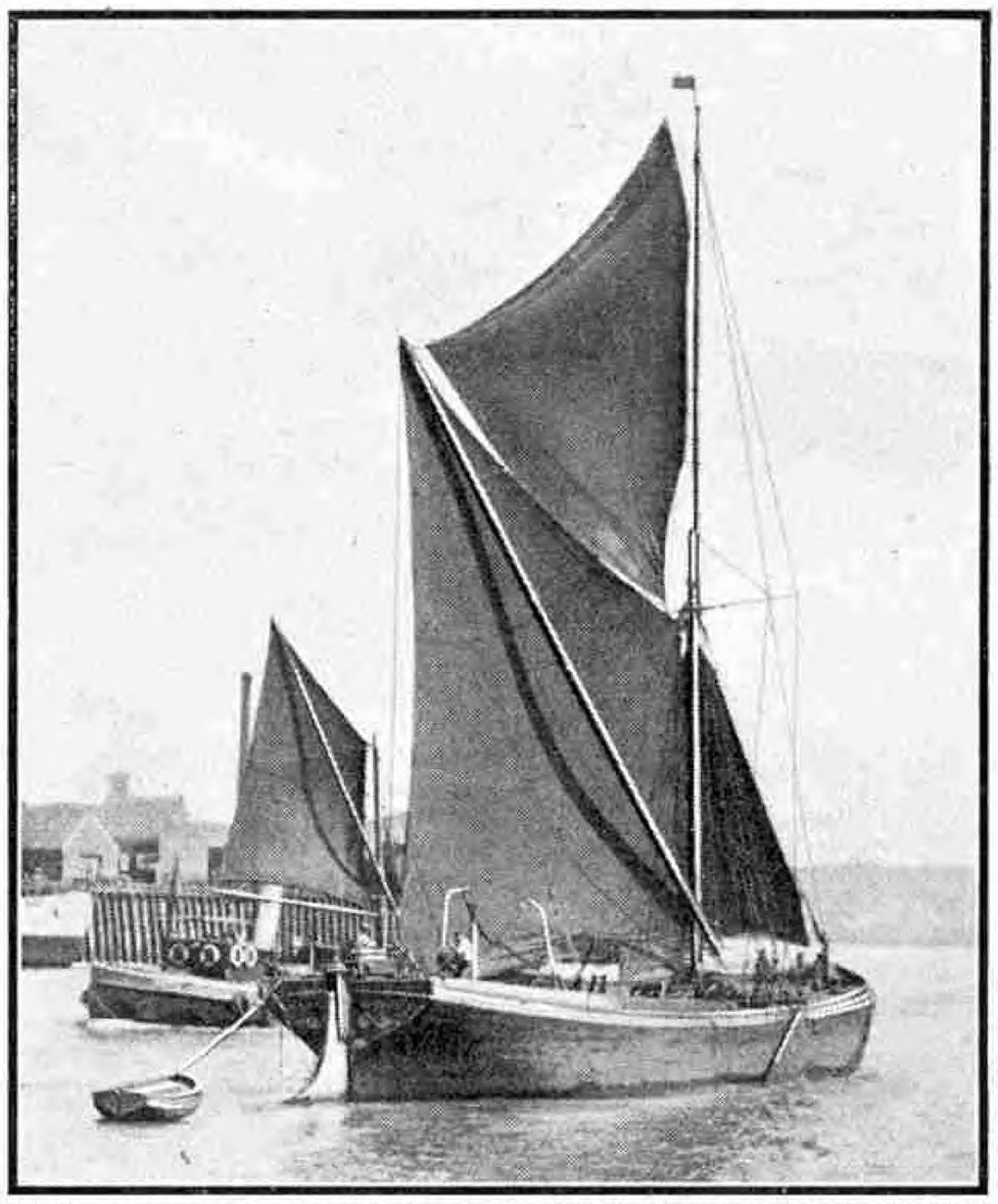
By W. Philip Conolly

THE many picturesque sailing barges at work on the Thames and Medway, in the coastal trade, down Channel and up the East Coast, are the descendants of a long line of craft, the origins of which are extremely remote. Through many years the sailing barge has been slowly adapted to the altering conditions of trade, until to-day she provides a service which, although somewhat slow, cannot be exceeded in cheapness by any other form of vessel. Carrying anything from 100 to 300 tons of cargo, and worked by two or at the most three men, the barge can convey freight more cheaply than any powered vessel afloat.

It was long believed that the sailing barge was Dutch in origin, and her leeboards, spritsail and hull form were referred to as confirmation of this view. It is becoming increasingly realised, however, that she has developed solely on the Thames and Medway rivers and in certain East Coast ports. This did not preclude the introduction of foreign features, however, and no doubt Continental details that had proved their worth in practice were used in English designs from time to time.

Several individual barges have attained considerable ages. One of these was the "*Favorite*," which was still carrying cargoes a few years ago, although she was nearly 130 years old. She was built at Rochester in 1803 and partly rebuilt in 1898, and is still in existence. Her days of active work are now over, however, and she is used merely as a floating residence in Chiswick Reach.

Spritsail barge is the generic term applied to these craft, but various other names are used, mostly referring to variations in sail equipment. Two kinds are built. Barges of the smaller or river class have a length of 60 ft. or 70 ft., and find most of their work in the Thames and its estuary. The coasting class contains the larger type of barge, and this category includes some big vessels approaching 100 ft. in length, with a beam of 22 ft. or 23 ft. These barges are really sea-going ships, working not only in the coastal trade, but also making passages in both summer and winter to many North Sea ports from France to the Scandinavian countries. Several of these vessels have made still longer trips in recent years, some even crossing the Atlantic to work on the River Amazon.



A Thames barge passing into Greenwich Reach. The heavy boom or sprit supports the peak of the sail. Photograph by Stanley, Welling, Kent.

River craft are grouped in three classes, two of which have no bowsprit. These are "stumpies," which are without a topsail, and topsail barges, and it is the extra sail of the latter group that is the reason for the two classifications. "Stumpy" barges may still be seen on the tideway, but they are now relatively few in number. The third group consists of river bowsprit barges working within the outward limits Naze to North Foreland.

The modern form of spritsail barge, known as a "spridie" or "spreetie" to the men who sail her, was rapidly developed about half-way through last century, and the institution of the annual Thames Barge Races in 1863 greatly influenced her further development. Some years later the Medway began holding its own series of races, and except for two or three years missed by one section or other, these events were held right up to the War, the last taking place in 1914.

The year 1927 saw the re-introduction of both races, and contests have been held regularly since. These have attracted fine ships, many of which have been built specially to compete. Barges well known in recent events include such vessels as "*Sara*," "*Cambria*," "*Queen*" and "*Phœnician*;" the first of these was a winner in her class in both Thames and Medway contests in 1937. The full course of the Thames race extends from the Lower Hope, the stretch of the river below Gravesend Reach, outward to the Mouse Lightship and back; Medway race entrants commence at Gillingham and turn for home at the same point, the Mouse Lightship.

A modern sailing barge is built of steel, and many fine vessels have appeared in recent years. As the hull is perfectly flat-bottomed, the barge can ground in an upright position on any reasonably flat shore. The deep keel used in other types of sailing ship is replaced by the characteristic leeboards carried by all sailing barges, and her shallow draught enables the vessel to reach spots inaccessible to other craft of a similar tonnage. Barges at times make their way into extremely restricted nooks and corners; in some cases at least one leeboard must be unshipped to get the boat to her destination.

The straight-sided hull has bluff bows with a vertical stem rising from the keel and keelson; the keelson is the main stiffening agent running the length of the hull and jutting above the timber flooring or "ceiling." The bows have not always been so bluff. Years ago barges were built with overhanging bows, or "swim" heads, like the ends of a punt, but very few of these "swimmies" are to be seen nowadays. Apart from a few counter-sterned barges, the stern is always of the transom type and has no counter or overhang; and the quarters of the hull are shaped but cut off short to make an almost square stern.

The leeboards are situated one on each side of the hull, in line with the mast. They take the place of a centre keel, and prevent the ship from being blown off her course sideways through the water, making "leeway." In shape a board suggests the fin of a fish, but instead of extending at right angles to the hull, it remains flat against the vessel's side. It is suspended at the top or narrow end, and for use the wide end is dropped several feet below the hull to give the ship a good grip in the water. When it is necessary to take the ground, or the board is not required in a following wind, it is raised to a horizontal position by a small winch.

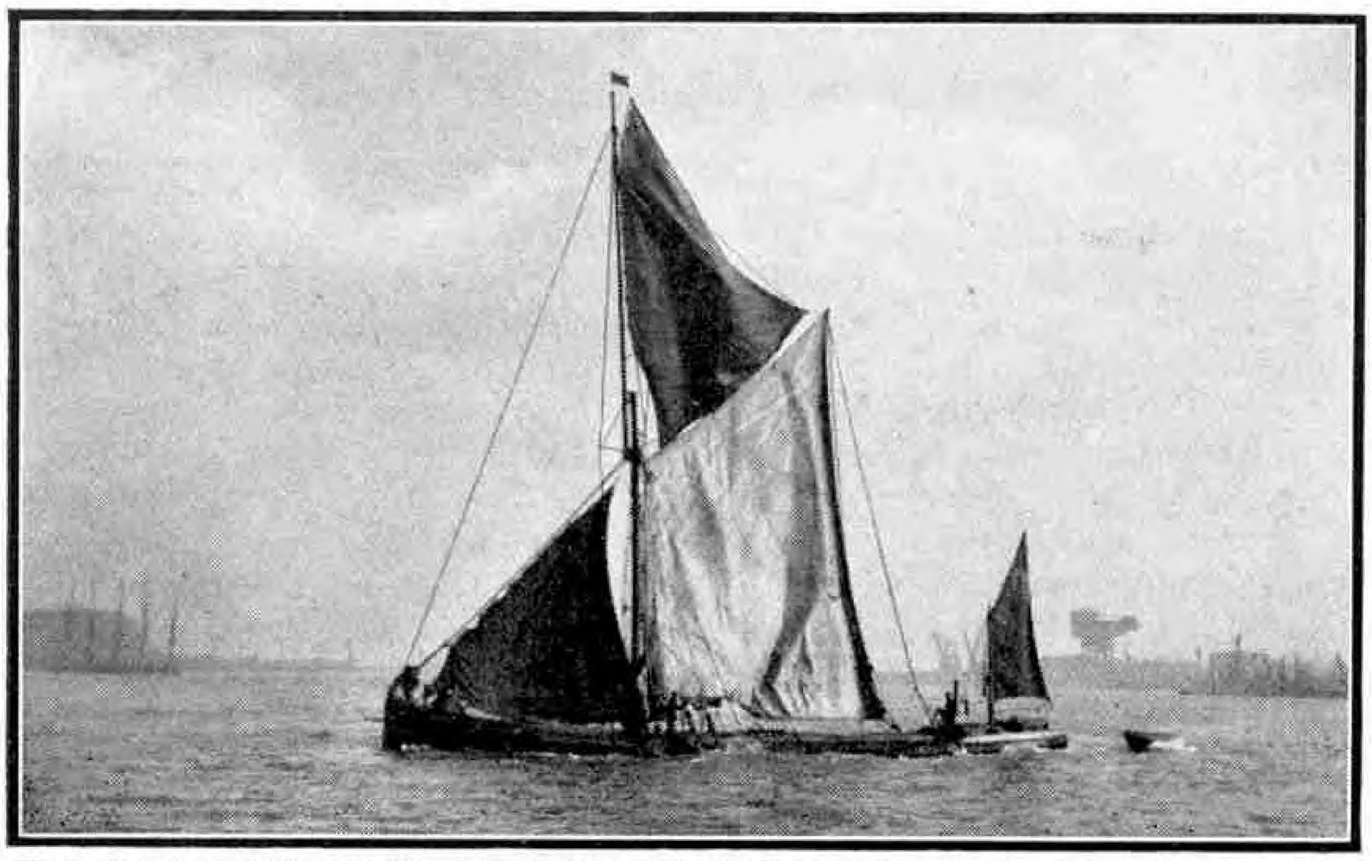
In the deck, a main hatch and a small forward hatch give access to the hold, and between these the mast is placed. The extremities of the hull contain a cabin aft for the skipper, and one forward for his mate.

The mast is about one third of the vessel's length from the stem and is supported in a mast case, which is box-shaped but has no top or after side. As it is necessary to lower the mast when passing under bridges, its foot does not extend below the deck, and its weight is taken by a very strong stanchion footed on the keelson on the floor of the hull. Erecting the mast is known as "heaving up," and is achieved by means of tackle led to the anchor windlass, which gives great power for what is a weighty operation, since the mast, topmast and mainsail with all their gear, weighing several tons, are raised together. Three wire rope shrouds on each side, the forestay running from mainmast head to stem head, and backstays, give support to the mast, and the shrouds on the starboard side have ratlines or foot ropes.

The topmast is steadied by a wire shroud on each side, and by fore and back stays. Two mast caps on the lower mast head provide a footing for the top section, and a fid, an iron bar running through

a hole in the topmast foot, rests on the lower mast cap to prevent the upper section from dropping. Before the mast is lowered to the deck preparatory to working above London Bridge, it is necessary to drop the topmast so that it stands just forward of the main or lower section. This is done by means of ropes and pulleys called sheaves, and is always described as "dowsing the topmast."

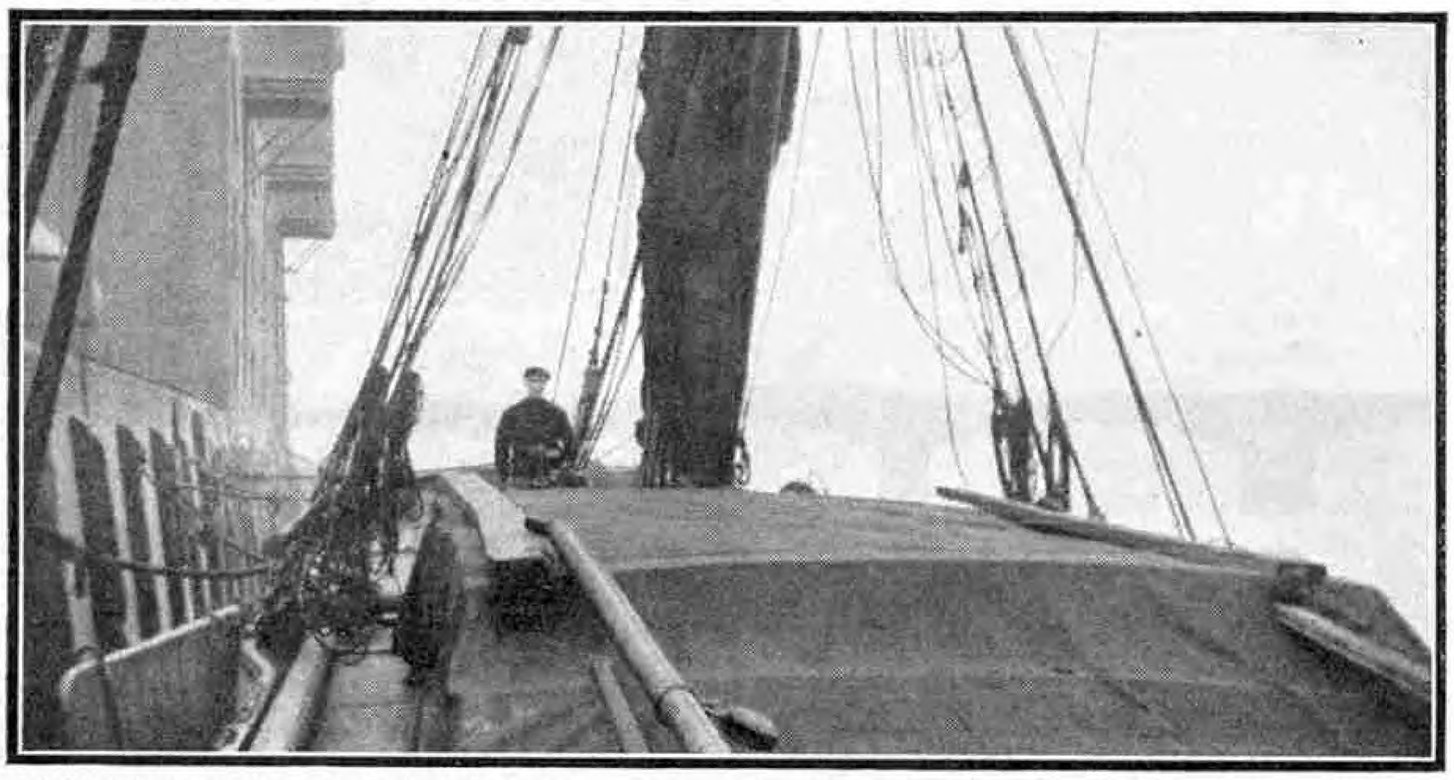
The spritsail that gives its name to the barge, and is its most characteristic feature, is the large fore and aft mainsail, which is carried by a heavy boom or sprit that may weigh a ton or more. This is supported at its foot on the mast by an iron collar, known as a "muzzle," and it extends diagonally upward towards the stern. Its upper end, supporting the "peak" of the sail and stretching the whole sail head taut, is kept in place by a strong head rope from the lower masthead below the lower cap, and by two wire ropes or vangs—"wangs" the men call them—leading down, one on each side, to the deck. Further support is provided at the foot of the sprit by a chain leading to the top of the lower mast, and by the "yard tackle," a sling from the masthead to a point halfway down the sprit.



The sailing barge "Monarch" tacking in Woolwich Reach. Topsail and mainsail have lost the wind as the barge makes a fresh tack.

The sail when stowed is not reefed like a square sail, but is "brailed" or gathered up into the angle made by the head rope and mainmast. The ropes or brails facilitating this operation are secured to each side of the "leach," or after edge, of the sail. They then run through blocks on the head rope to other blocks on the shrouds, from which they are led down to the deck. The main brails, which take the heavy centre portion of the sail, are operated by a small winch, while the smaller "uppers" and "lowers" are taken in by hand. The lower after corner, or "clew," of the sail, has a controlling rope called a "sheet" that keeps the sail stretched taut, and this is secured to a travelling ring, which runs on a long bar called a "horse," placed athwartships.

The topsail, hung from a small yard, is hoisted by a halyard on hoops sliding up the topmast, and its clew is extended or "sheeted" sternward to the peak of the mainsail by a topsail "sheet," which is led down to the deck. This sail is stowed or "clewed" by a light rope called a clew-line, which runs from the clew to the topsail yard through a block and thence down to the deck. Sometimes the sail is only dropped temporarily, but if a complete stow is desired the halyard and sheet are let go and the clew-line bunches the sail at the foot of the topmast. Gaskets, which are short lengths of rope, are then used to secure the sail to the mast.



Looking forward along the deck of "Blue Mermaid," a sailing barge of the coasting class. On the left is the upper part of the port side leeboard.

Additional sails, placed forward of the mast, include a fore or staysail, and one or two jib sails, with sometimes an extra flying jib or "spinnaker." All these are carried on the forestays and bowsprit. The bowsprit is not of the "standing" variety, that is it is not a fixture, although it has its own shrouds and bobstay to keep it in place, but when the barge has to enter narrow creeks or work "above bridges," it can either be raised to stand vertically, or else be completely unshipped and stowed on deck.

The mizzen-mast and sail at the stern is actually a tiny replica of the mainmast and mainsail, except that there is a small boom at the sail's foot in addition to the diagonal sprit. It is of little use in driving the ship, but is chiefly employed to assist in steering, pushing the barge's stern round in conjunction with the rudder. The mizzen sheet from the after corner or clew of the sail is fastened to the outer edge of the rudder blade. Like the mainsail and mast, the mizzen is fitted in a mast case and is lowered whenever necessary.

The attractive red or tan colour of the sails is obtained by dressing them with a mixture of oil and red ochre, and as this never dries out completely, the sails are always in a pliable condition. Many barges carry advertisements, trade-marks, or owner's distinguishing marks, chiefly on their main and topsails.

Most of the barges are worked by two men, the master and his mate, who are real sailors in every sense of the word. Occasionally, when a longer voyage than usual is undertaken, or when the barge is working in restricted waters, a third man is carried, and then the usual crew must pay him half his wages and also provide his food. Sometimes another man known as a "huffler" comes aboard to help in working the barge by reason of his intimate acquaintance with a certain locality that may not be known by the regular crew. Various systems are in force regarding payments of crews, the most usual being an allotment of half the vessel's earnings to the skipper, the owners retaining the other half, and the skipper paying his mate out of his own portion. If the barge requires the services of a tug "above bridges," the skipper sometimes pays the entire towage fee, or he may be allowed part or all of the cost of a tug, especially if the freight is valuable or is wanted urgently.

The majority of the barges are not fitted with auxiliary power and they work up and down the river with the tide, "drudging" as it is termed. The anchor is allowed to drag along the river bed, and by moving her rudder the barge can be directed to either side of the stream. To get back into the tideway again, the anchor is allowed to "bite" and the barge is "sheered" across the stream towards the opposite shore. By this method the barge can remain in or leave the main stream at will.

The largest coasting barges in use to-day are several owned by F. T. Everard and Sons Ltd., by courtesy of whom it is possible to give the following details relating to the *"Will Everard."* The hull of this vessel is 97.6 ft. in length, her breadth is 23.1 ft. and her depth 9.6 ft. The mainmast and topmast have lengths of 48 ft. and 40 ft. respectively, and the sprit measures 64 ft. The bowsprit is 32 ft. in length and the mizzen-mast 36 ft., and the total sail area carried amounts to 5,000 sq. ft. The deadweight tonnage is 280, the gross tonnage 190, and the net tonnage 150. These vessels are built of steel, and are classed +100 A.1 at Lloyds.

This year's Thames sailing barge race was held on 21st June, when the full course had to be shortened as calm weather prevailed. The winner *"Surrey"* took about seven hours to complete the shorter course, but a faster time was made by *"Veronica,"* which was disqualified.

The author desires to acknowledge with thanks the valuable assistance given by Mr. F. G. G. Carr, both personally, and by means of his book *"Sailing Barges."*

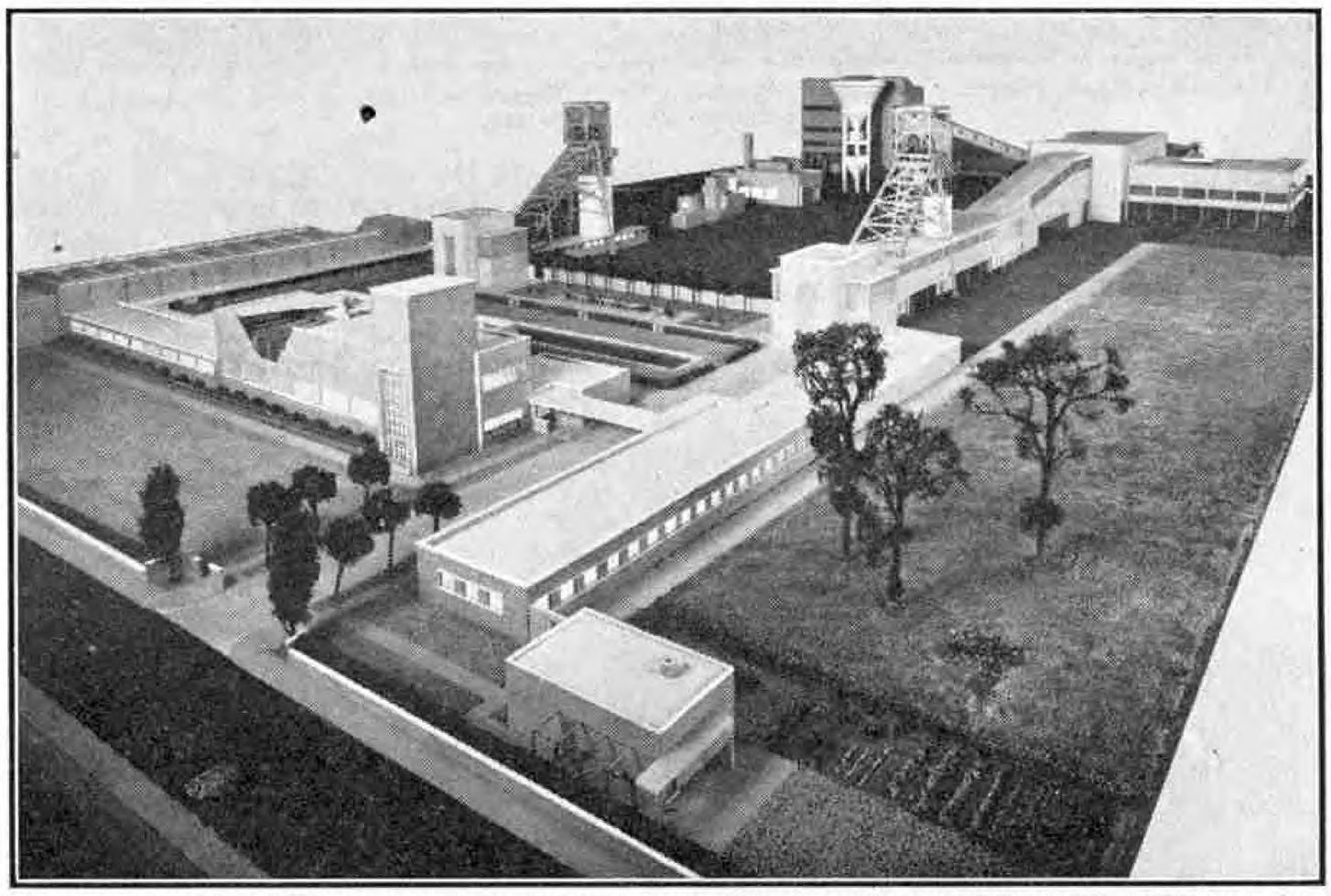
Coal Mining in Miniature

Working Model at the Empire Exhibition

By W. J. Bassett-Lowke, M.I.Loco.E.

MOST great exhibitions make extensive use in their displays of scale models designed to give the observer an accurate impression of prototypes which, by reason of their size, cannot be reproduced, even in part, on their actual scale. In this respect the Glasgow British Empire Exhibition is no exception to the general rule. Indeed, the pavilions there seem actually to vie with one another in the originality and beauty of their models, among which one of the most unusual is that of a coal mine that forms a prominent feature of the Coal Hall in the United Kingdom Government Pavilion. This model is believed to be the most comprehensive of its kind in the world, and it provides a quite remarkable demonstration of modern coal-mining methods and the workmanlike layout of the colliery of to-day.

The model is 19 ft. long, 11 ft. wide and 15 ft. high. It was built in the comparatively short time of $4\frac{1}{2}$ months, and has been designed to give visitors to the Hall a clear insight into the layout and workings of a completely electrified modern colliery employing 1,500 men and producing 2,500 tons of coal per day. The scale is $\frac{1}{4}$ in. to 1 ft., so that a length of 1 in. on the model is equivalent to 4 ft. in the real mine.



The surface layout of the giant model coal mine described in this article. The model illustrates mining operations underground as well as work at the surface and is believed to be the most comprehensive model of its kind in the world.

All the parts are working, and the model makes use of no less than nine electric motors and 20 yds. of conveyor belt. At Northampton, where the model was constructed, it was found that it could not be built economically in one piece, and therefore the model craftsmen divided it into a series of about 40 sections of convenient size. It was taken apart into these sections for packing for transport, and was re-erected on arrival at Bellahouston.

A small preliminary model, or "mock-up" as the model-maker calls it, was first made. This is shown in our first illustration, and gives some idea of the complete layout. It is rectangular in shape, representing a block of earth 700 ft. deep, with typical layers of blue shale alternating with grey and yellow sandstone. The coal seams are black, and panels set into the sides of the seams and strata give sectional views of the mine workings. The surface area of 11 acres, which on the large model is reached by a special gallery, disproves the theory that a mining colliery must be dreary and unattractive. In planning it those responsible for the model have had the assistance of the architects of the Miners Welfare Committee. The office and administrative buildings are separated from the industrial workings by a row of trees, and gardens enhance the attractiveness of the natural surroundings.

Let us trace in the model the path of the coal from the time it is cut from the seam until it is ready in railway trucks for transport. Three methods of winning it are shown. There is a conveyor face, which is fully mechanised, with both coal cutters and conveyors in use; and a long wall face, which is partially mechanised, with coal cutters but no conveyors. In addition bord and pillar workings are shown. In the first two methods the whole of the coal in a seam is extracted, but in bord and pillar working only about 50 per cent. is removed. In this system rectangular pillars are left as supports for buildings on the surface, or for workings in other seams. The bords are the roads or passages driven between the pillars to the workings. The conveyor face is worked in three shifts, the operations in these consisting of cutting the coal, loosening and removing it, and moving the machinery forward for the next day's work. Each shift of eight hours is in the charge of a certified mineworker, who makes regular inspections for gas and sees that the roofs and sides are properly supported.

Imagine the coal face as a cliff. It is first undercut by the coal-cutting machine, in which there is a revolving chain armed with short picks. As these revolve the machine is pulled forward along the face. The second shift of the "fillers" comes in to find that the bottom 6 in. of the coal face have been cut out to a depth of 4 ft. 6 in., and their job is to bring down the wall and load it on to the conveyor. They loosen the coal by blasting, and "break in" with pick and shovel; and the "shaker" conveyor delivers it to a main road, or "mothergate" belt, as it is called, which carries the coal to a point where the tubs are loaded at the end of the mechanical haulage system.

All coal should be cleared off the face by the end of the fillers' shift, and then come the "drawers" and "stonemen." It is the job of the drawers to dismantle the

conveyor and re-erect it 4 ft. 6 in. nearer the new face. Meantime the stonemen are extending the stone packs or walls placed at intervals along the face to prevent undue crush from the roof. They also clear stone from the roads leading up to the face. This is blasted out to make sufficient head room, and the stone thus garnered is packed behind girders at the sides of the roadways. The main road in the language of the miner is known as the "mothergate" and the access roads leading to the remote ends of the faces as "tailgates," "airways" or "timber roads."

The drawers, having moved the conveyor forward, pull out the last row of pit props and allow the roof to sink in behind them. Then the mothergate belt is extended 4 ft. 6 in. to bring it up to the end of the face conveyor and, after a trial run to see everything is in order, the face is ready once more for the cuttermen.

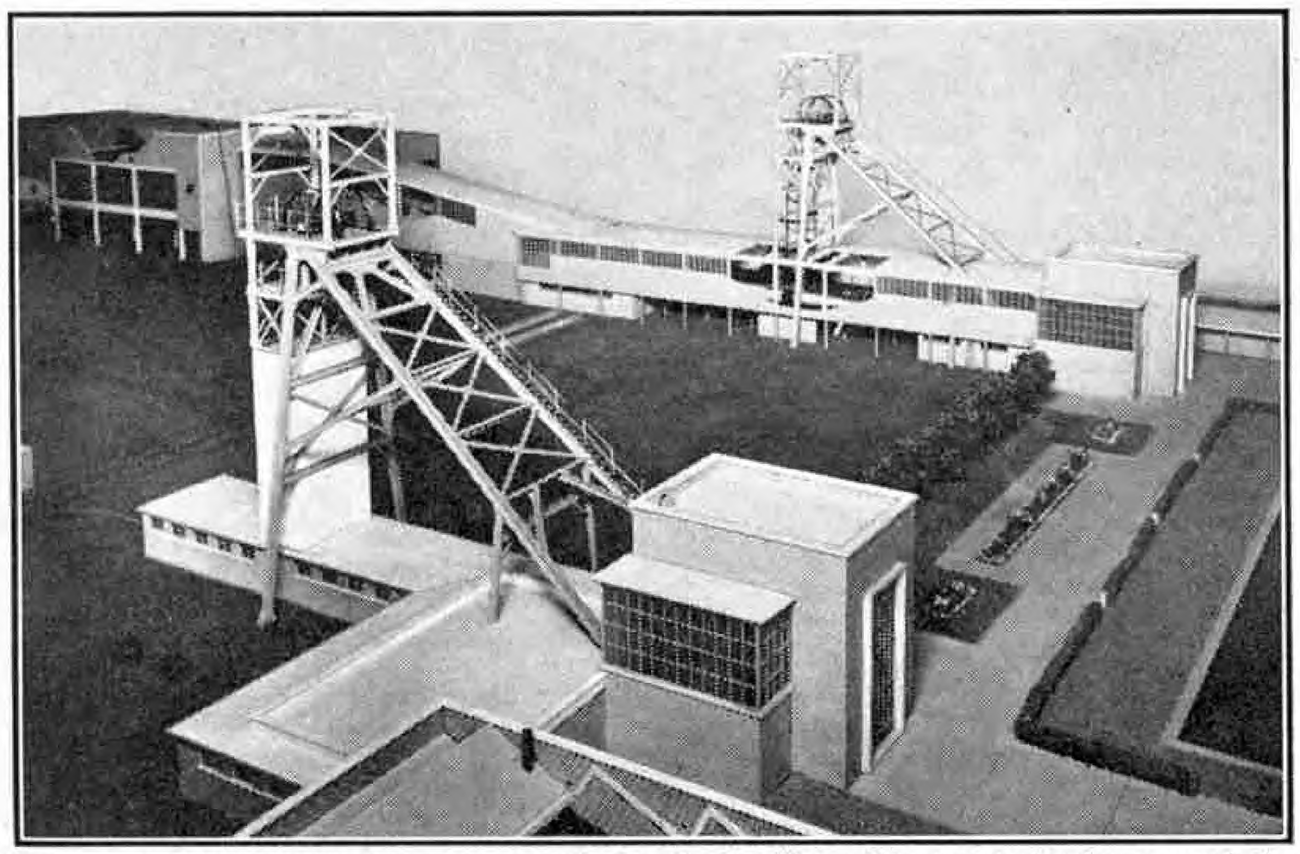
The output from the face as shown on this model—60 yards long—would be about 110 tons a day. The units of a mechanised pit on a large scale would each produce anything from 500 to 600 tons a day.

The mothergate belt is a rubber belt that takes the coal from the face conveyors and carries it along the steel arched mothergate to the point where it is loaded into the tubs, which then run by gravity to the mechanical haulage rope.

The advancing long wall face in the model illustrates another method of removing the whole of a coal seam. The rock and strata are allowed to subside behind the miners as they advance. The various gateways give access to the coal face, and the ponies draw out the coal in tubs. This face also shows the modern method of supporting a roadway by means of steel arched girders.

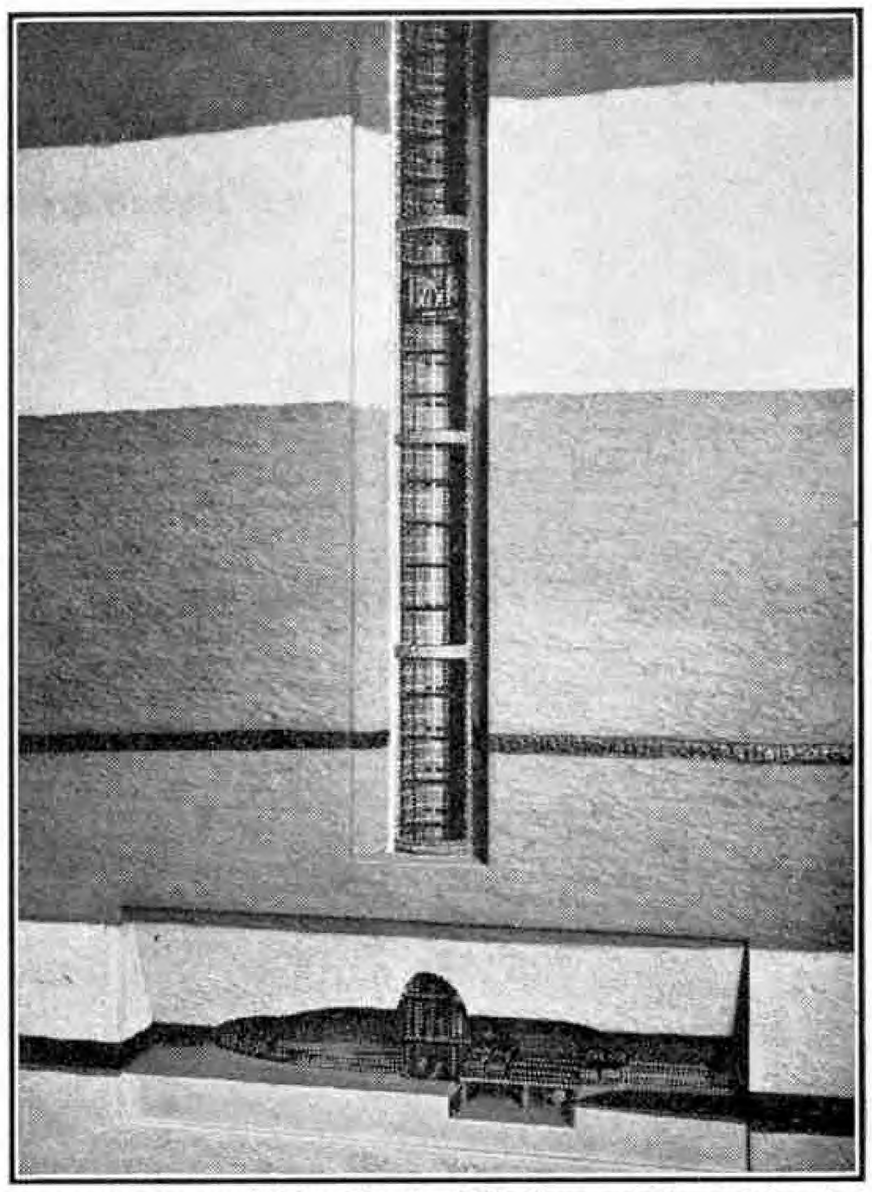
One of the insets of the model shows the transformer housing, water pumps and pony stables. The ponies work the same hours as the men. Each has his own stall marked by a board giving his name and height, the date he came down the pit, and his shift, after which he is groomed by an experienced horse keeper. The transformer housing or electrical sub-station distributes current to the underground workings, and the main centrifugal pumps draw the water from auxiliaries and send it to the surface.

Another inset shows a haulage engine, which draws an endless rope to which the tubs of coal are attached as they come from the various workings. Then comes the arched haulage road itself, along which full tubs are drawn to the pit bottom, and the empty tubs return to the various workings. This haulage system operates by signals, and both signalling and telephone wires run along it. In the last of the insets we find the pit bottom with the coal drawing shaft, an important and interesting section of a mine. The shaft is shown in section, with a single-decker cage going up and another coming down. The tubs are changed in an ingenious manner by mechanical rams, operated by compressed air, which push the full tubs into the cages and the empty ones out.



The two pit headgears of the model mine at the Empire Exhibition, Glasgow. In the foreground is the shaft used by the miners, which is also the outlet for the current of air ventilating the workings. The second shaft is used for drawing coal.

Following the coal above ground we come to a modern steel structural pit headgear. The cages with full tubs of coal arrive on the banking-out level and pass to the end of the shaft gantry, where they are picked up by a horned creeper belt that conveys them to the tippler house. There the tipplers empty the coal on to screens of various sizes, and one of the surface insets shows the large coal on the picking bands. Best coal and large cobbles are immediately loaded into the wagons for sale, and the smaller coal, from medium cobbles downward, is taken by conveyor belt to the washery, where it is cleaned in a fast moving current of water and graded so that nothing is wasted. The stone and rock drawn from the pit with the coal are taken by aerial ropeway to a dump away from the colliery.



An inset of the model showing the pit bottom and the coal drawing shaft. A single-decker cage is shown in the shaft.

The second shaft is used for men and materials. It is airtight and is linked by an underground tunnel to the exhaust fan ventilating the pit. In a real coal mine about six tons of air are circulated for every ton of coal produced.

The office buildings of the model are modern in style, with plenty of windows, and an outstanding feature of the administrative part of the model is the modern pit-head baths, with row upon row of shower baths. A workman coming to the colliery puts away his bicycle in the shed, and enters the "clean" side of the baths. He leaves his clean clothes in a locker and dons his pit clothes, greases his boots and goes out by the pit door. He collects his lamp from the lamp room, takes his explosives from the explosives distribution house and is ready to descend. On returning after the shift he reverses these proceedings, leaving his pit-clothes in the pit locker room, and donning clean clothes ready for going home.

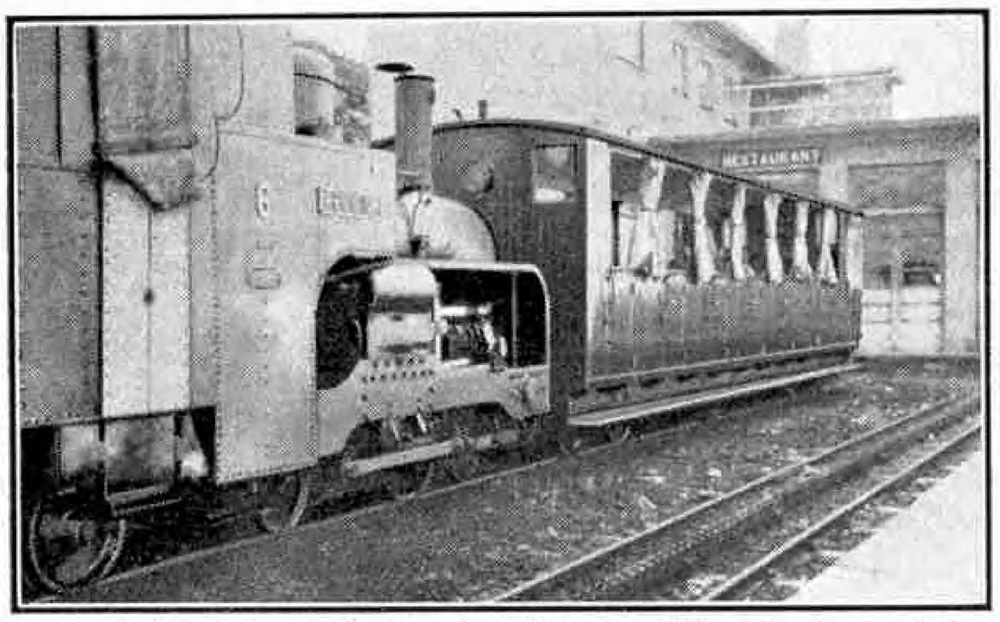


These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

The Ascent of Snowdon

While on holiday in North Wales I made the ascent of Snowdon by the rack railway from Llanberis. From the accompanying photograph it is easy to see the peculiar construction of the locomotives in use on this line.

The mountain is very precipitous, there being sheer drops of 1,000 ft. on each side of the railway in places. Trains at their highest speeds only reach about 6 m.p.h. The engines use a rack to enable them to climb the steep gradients, and there are two loops for trains to pass each other. At one of these loops we had to wait 10 minutes in the chilly mountain air.



A train in the station at the summit of Snowdon. This station is at a higher altitude than any other in Great Britain. Photograph by C. O. Bray, Bristol.

At last we reached the little railway terminus at the summit. This station is 3,570 ft. above sea level and is the highest in Great Britain.

The summit of the mountain is generally in the clouds, but I was fortunate, for the clouds were blown away for a few minutes while I was there and I was able to see the lighthouse at Holyhead, 25 miles away, and eight different lakes.

C. O. Bray (Bristol).

Growing Orchids from Seed

A short time ago I paid an interesting visit to a large orchid nursery near Leeds, where I saw how orchids are grown from seed. The nursery consists of several large greenhouses on a sunny hill side, and surrounded by woods, makes an ideal spot for such work. The air in the houses is hot and damp, and the temperature well over 100 deg. F., but even in these conditions the orchids take seven years to reach the flowering stage, when they can be sold.

When the seed-pod of an orchid is ripe, nine months after the pollination, it is carefully removed and given a number. The seeds from it are put in a sterilized test tube containing a jelly made from a Chinese seaweed, to which three phosphates with sugar, salt and iron have been added. They germinate after a few weeks, and a year later the minute seedlings are removed and put into a specially prepared flask. They are given enough water to last a year, and during this time they are not touched by hand, nor are the tubes moved, except for observation.

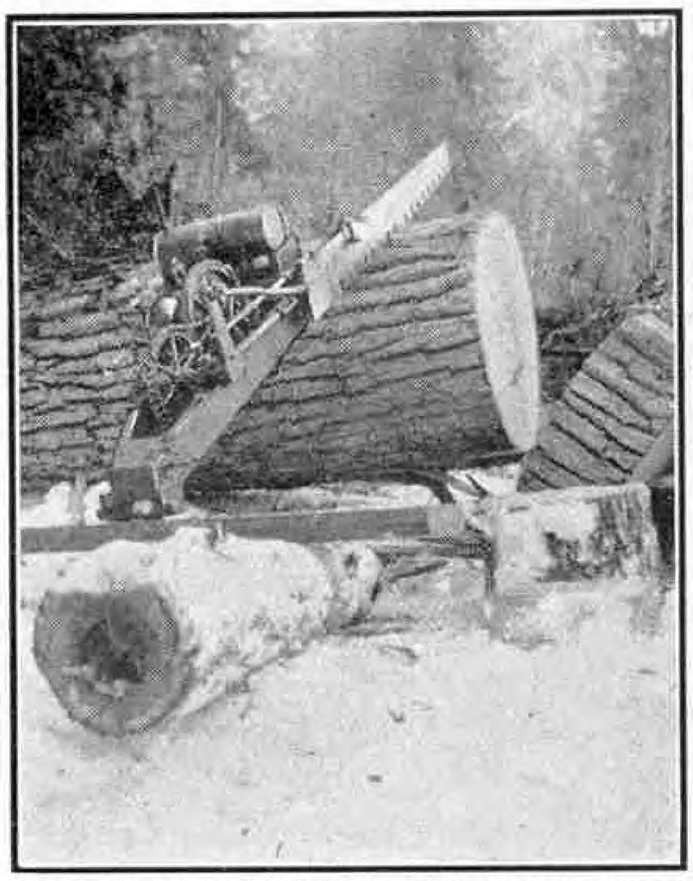
A year later the tiny plant is barely a quarter of an inch high, and it is taken from the flask and put in a small pot along with some sphagnum moss, the colour of which shows whether the plant is moist enough; and butterwort, an insectivorous plant, to catch small flies that might lay their eggs in the soil. After that it is four years before the plants, each looking like two small blades of grass, are ready for transplanting into the larger flowering pots.

G. D. Bennett (Leeds).

Cutting Firewood in British Columbia

On the west coast of British Columbia most people use wood for fuel. Anyone who has used a crosscut saw knows how tedious it is to cut up big logs, yet there are many who cut up their own supply by hand, and in the average home a large amount of wood is burned in a year.

In some districts there are plenty of hardwood trees about 8 in. in diameter. These make the best firewood, and are most easily cut up with the aid of a power-driven circular saw. For the big timbers we use the portable crosscut saw shown in the accompanying photograph. This has a blade 7 ft. long and is driven by a 4 h.p. petrol engine, working on the two-stroke cycle. The tanks for the water and the petrol can be seen in the illustration. The saw is fixed to the log by means of L-shaped dogs bolted to the frame sides, and can be moved along after each cut. Only a few seconds are required to set up the saw in a new position.



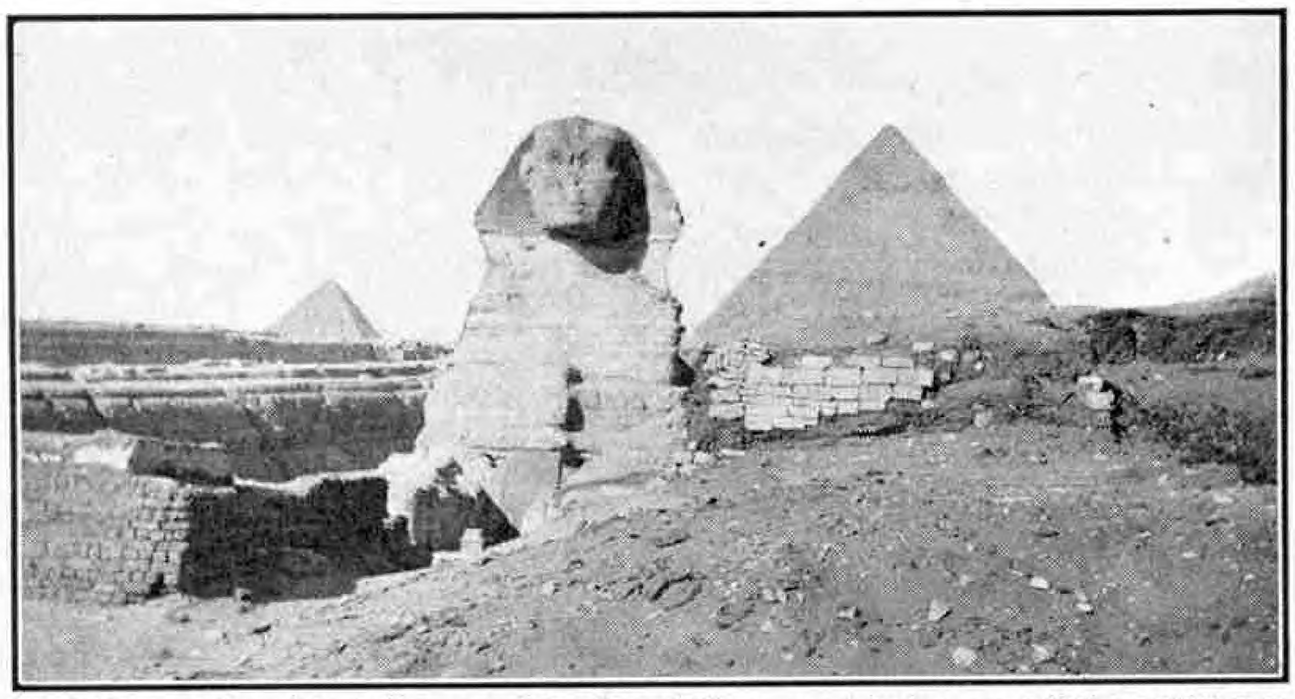
Log-cutting in British Columbia with a petrol-engined saw. Photograph by J. Bushell, Bella Coola, B.C.

The tree shown is a cottonwood that yielded eight cords of firewood, a cord being a unit of split wood 8 ft. long, 4 ft. high, and 4 ft. across, a total of 128 cu. ft. The saw cut through the tree in less than five minutes, and I should say that it does fully as much work as six men. J. Bushell (Bella Coola, British Columbia).

By Camel to the Pyramids

When in Cairo last year I took the opportunity of visiting the Pyramids and the Sphinx at Giza. These can be reached by motor car, or even tramcar, from the centre of the city, but I and my friends hired camels to carry us over the sand because this made the journey more interesting.

On our strange mounts we soon reached the Pyramids, the most important of which is the Great Pyramid built by King Cheops about 3,000 B.C. Another was constructed by King Chephren, while three smaller pyramids, supposed to be the tombs of the daughters of Cheops, stand near by.



The Sphinx and Pyramids at Giza, near Cairo, Egypt. These were built between 3,000 and 2,000 B.C. Photograph by P. Lawrie, London.

Close to the Great Pyramid is the Sphinx, one of the Seven Wonders of the Ancient World. This figure, hewn out of solid stone, represents a great crouching lion with a human head, and between its two extended paws is a granite altar with an inscription denoting that it was built in the Fourth Dynasty, probably about 2,850 B.C. The Great Pyramid is 450 ft. high and towers over the Sphinx, the height of which is a mere 66 ft.

We also visited the mastaba tombs of the nobles of the courts of Cheops and Chephren. These burial places are of marvellous construction, and one that we entered has for its roof a single stone block, 16 ft. long and weighing many tons. The guides accompanying us burned magnesium ribbon to give us plenty of light, and to earn a little "backsheesh" for their trouble.

P. LAWRIE
(London S.W.19).

A Visit to Maiden Castle

Some little time ago I went to see the excavations at Maiden Castle, the prehistoric settlement to the south of Dorchester. This was inhabited by Belgae, members of a tribe that came from Northern France, and they settled at Maiden Castle about 80 B.C.

An old track led me to the settlement, which is on the flat top of a hill, on the side of which are great earthworks. I saw the deep dwelling pits with limestone walls, and was told that whenever pit homes became full of rubbish the occupants, instead of clearing this out, laboriously made new floors of mud and lime to cover it. Unknowingly they provided a link between their times and ours, for in the old floors rings, brooches and bracelets have been found.

I then made my way to the southern entrance where I was amazed to see the skeletons of 20 warriors, buried 2,000 years ago. J. WAKELEY (Bournemouth).

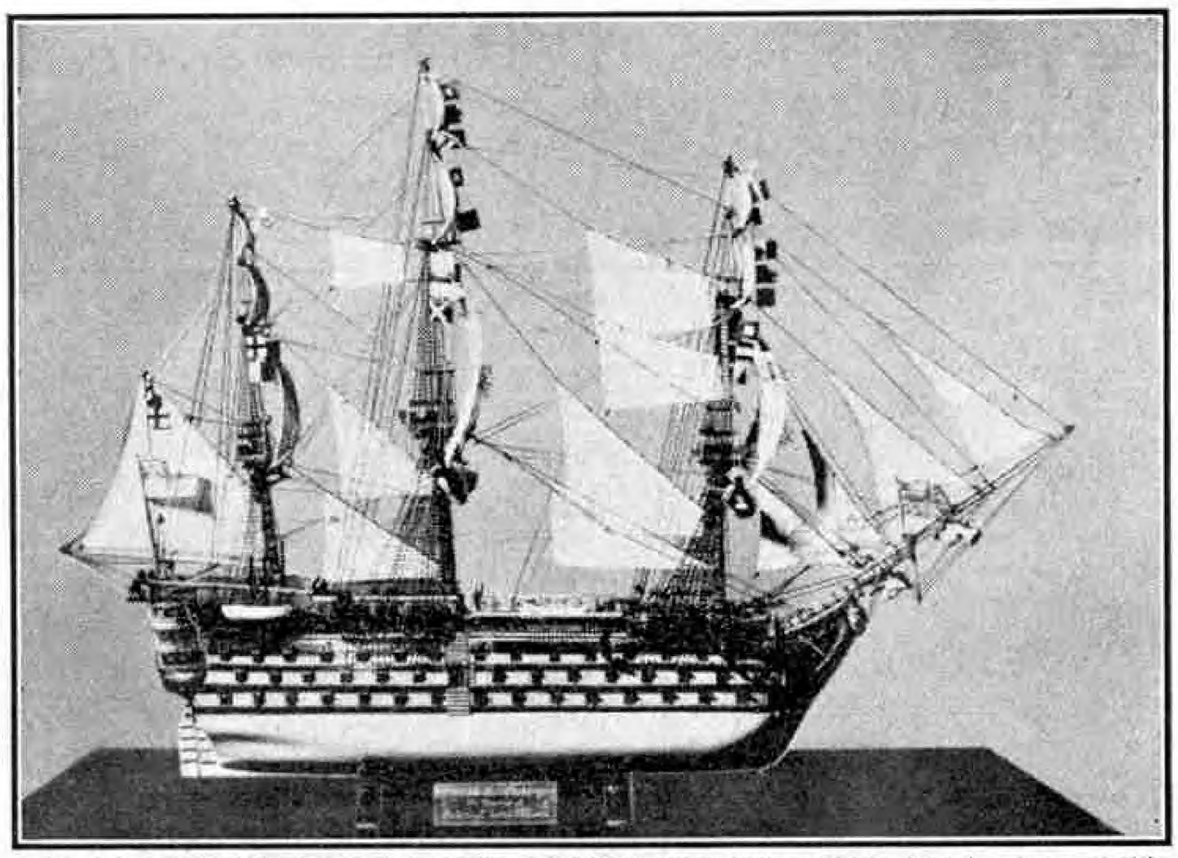
Building a Model of H.M.S. "*Victory*"

I spent about 18 months, working approximately five hours a week, in the construction of my model of H.M.S. "*Victory*," Nelson's flagship. The hull is of willow that originally formed part of a piano casing well over 100 years old, and the decks are of Pollard oak that also is more than 100 years old, so that the hull can safely be called antique.

The basket work framing at the bows consists of strips of thin card "squared out" with plastic wood and finally glued. The cupids at the figurehead were moulded in plasticine and coated with glue-size, which forms a hard shell and keeps the figures in shape. They were enamelled white before they were glued to the figurehead, and the method followed in constructing them has proved very successful.

The stern was shaped from layers of plastic wood on a wood core, the last layer being rebated for windows, which are represented by silver foil, lined with Indian ink to indicate the frames. The balustrading and raised ornamentation also were made of plastic wood, a task that was a trial of patience.

Deck fittings, such as skylights, were made of plaster and coated with glue-size before painting. Wire gauze was used for the poop and bulwark railings, and the belfry was built from $\frac{1}{8}$ in. dowelling carved to shape, and then glued. A pinhead represents the striker of the bell itself.



A fine model of Nelson's flagship "Victory" built by J. Edge, of Blackpool, who sent this photograph. The model is flying Nelson's famous signal at Trafalgar.

The guns, 108 in all, were shaped from $\frac{1}{8}$ in. dowelling, and bored with an Archimedian drill, and several powder kegs, buckets and chests were made and are placed about the decks to give realism to the model. The ship's boats were carved from the solid wood, and duly fitted with seats, rowlocks and oars.

Black twine was used for the standing rigging and fawn twine for the running rigging, small beads enamelled black representing blocks and deadeyes. The sails are of unbleached calico, with wire sewn into the edges to allow the effect of a strong breeze to be shown. The sails on the lower yards are furled, however, so that the details of the decks can be seen.

The model is painted in what I have confirmed to be the correct colours, black and ochre horizontal bars, red and gilt stern, and red inside the bulwarks and gunports. She flies Nelson's signal at Trafalgar, the colours and positions of the flags being explained to me by the Admiral Superintendent at Portsmouth, who gave me much kind assistance with them. J. EDGE (Blackpool).

In Search of New Models

Attractive and Unusual Subjects

THIS month we are illustrating four entirely different types of models as examples of interesting subjects for model-builders. The models include a Lister commercial truck, a steam-hydraulic engine, a motor-cycle, and an L.M.S. brake van and open wagon. They are of great interest in themselves, and the manner in which Meccano parts are used to reproduce interesting features will be a great help to those who wish to build similar models.

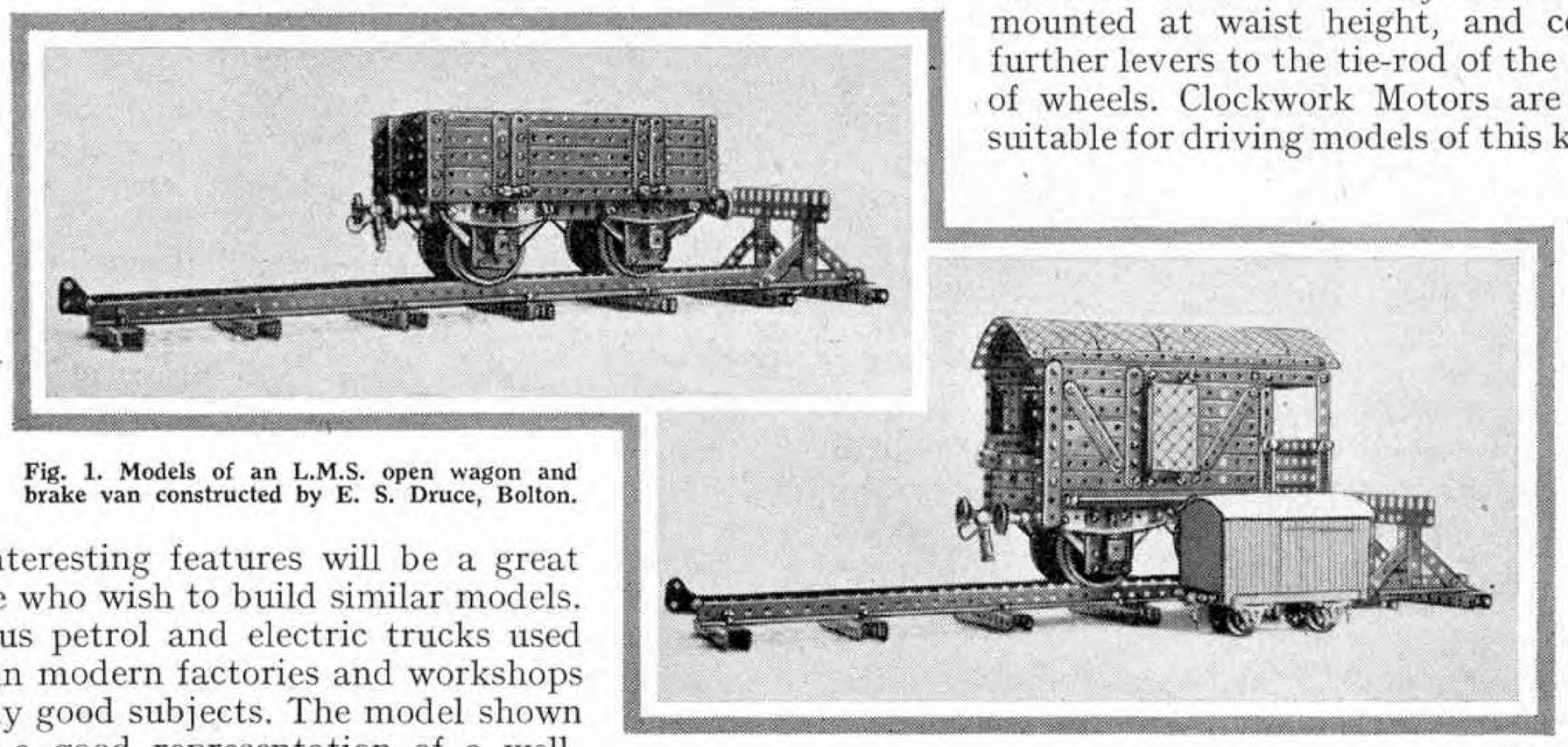


Fig. 1. Models of an L.M.S. open wagon and brake van constructed by E. S. Druce, Bolton.

The various petrol and electric trucks used extensively in modern factories and workshops provide many good subjects. The model shown in Fig. 4 is a good representation of a well-known Lister type, in which the power unit is a petrol engine. This is mounted on a ball bearing and steering is effected by turning the whole engine, together with the single wheel it drives. The truck is run under the tray carrying the load to be moved, and the platform is then raised by means of a special hydraulic ram mechanism, so that the tray is lifted clear of the ground. In the illustration the truck is shown carrying a scoop used for carrying concrete ready mixed, or loose material such as sand.

The model reproduces as far as possible all the movements of the real truck. It is fitted with sprung wheels, internal expanding brakes, a gear-box and platform raising mechanism, and the hydraulic ram used in the platform mechanism is represented by a system of levers that is effective in action. The model is driven by an E1 Electric Motor through a gear-box that is mounted inside the box-like engine casing.

Model-builders who do not possess sufficient parts to construct the model Lister truck shown in Fig. 4 should have no difficulty in building a smaller model using a *Magic* Motor as a power unit. The engine casing can be built up around this, with the brake lever protruding from one side, and the driving pulley of the Motor can be connected to the road wheel by a Driving Band.

The model forms a useful guide to the reproduction of the more conventional types of truck operated by electric motors. These are usually steered by a lever mounted at waist height, and connected by further levers to the tie-rod of the forward pair of wheels. Clockwork Motors are particularly suitable for driving models of this kind of truck, as they can be fastened in position horizontally to form part of the platform.

Turning now to a great favourite with model-builders, the steam engine in its immense variety of forms provides never-ending interests. The design and construction of valve gears, crankshafts and governor mechanisms of model engines present fascinating problems that can only be solved by actual experiment, and there is a wonderful thrill in seeing the pistons and the various mechanisms of a completed model working in unison.

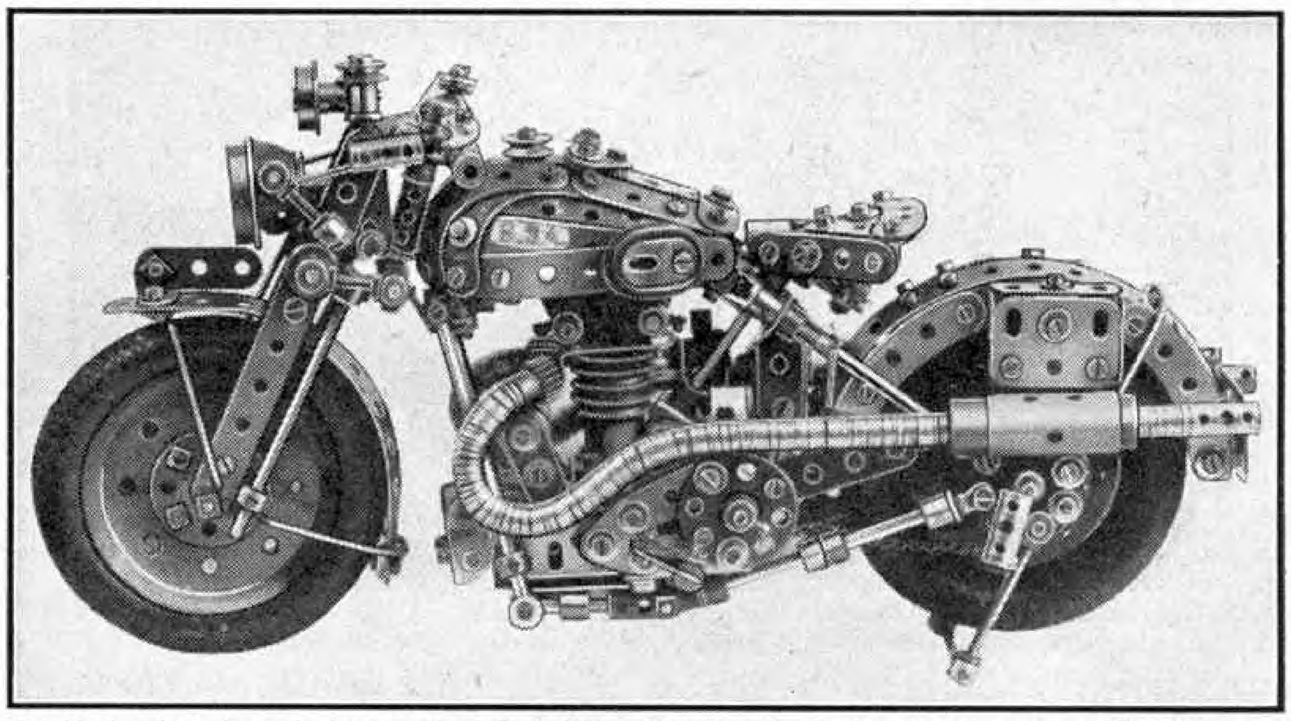


Fig. 2. A well-built scale model of a B.S.A. "Blue Star" motor-cycle. It is the work of H. R. Renard, London S.E.13, and contains several features of interest to model-builders.

The model shown in Fig. 3 is a good example of what can be done in realistic steam engine building and is remarkable for the amount of detail work included in it. The governor provides one example of the skilful way in which the builder has used the parts at his disposal. This is constructed from two small Fork Pieces, which are fastened on a short Rod so that their forked ends meet. Two Bolts are passed through the holes in the Fork Pieces, and Collars are screwed on to their shanks to represent the weights of the governor.

In passing it may be pointed out that governing appliances generally are interesting subjects for reproduction in Meccano, and a little time spent hunting out novel mechanisms of this kind will not be wasted. An unusual type of trip-gear governor mechanism invented by Proell was the subject of a demonstration model

described in the "Suggestions Section" of the July "*M.M.*," and there are many others well worth reproduction in Meccano.

A feature that adds to the realism of the model shown in Fig. 3 is that it is mounted on a raised base, so that the flywheel can be accommodated at the correct level. The flywheel is constructed from two Ring Frames fastened together by Flat Brackets, but if the model-builder does not possess any of these, 12½" Strips bent to shape can be used. For a fairly small model engine a well-proportioned flywheel can be made by bolting several 5½" × 1½" Flexible Plates end to end.

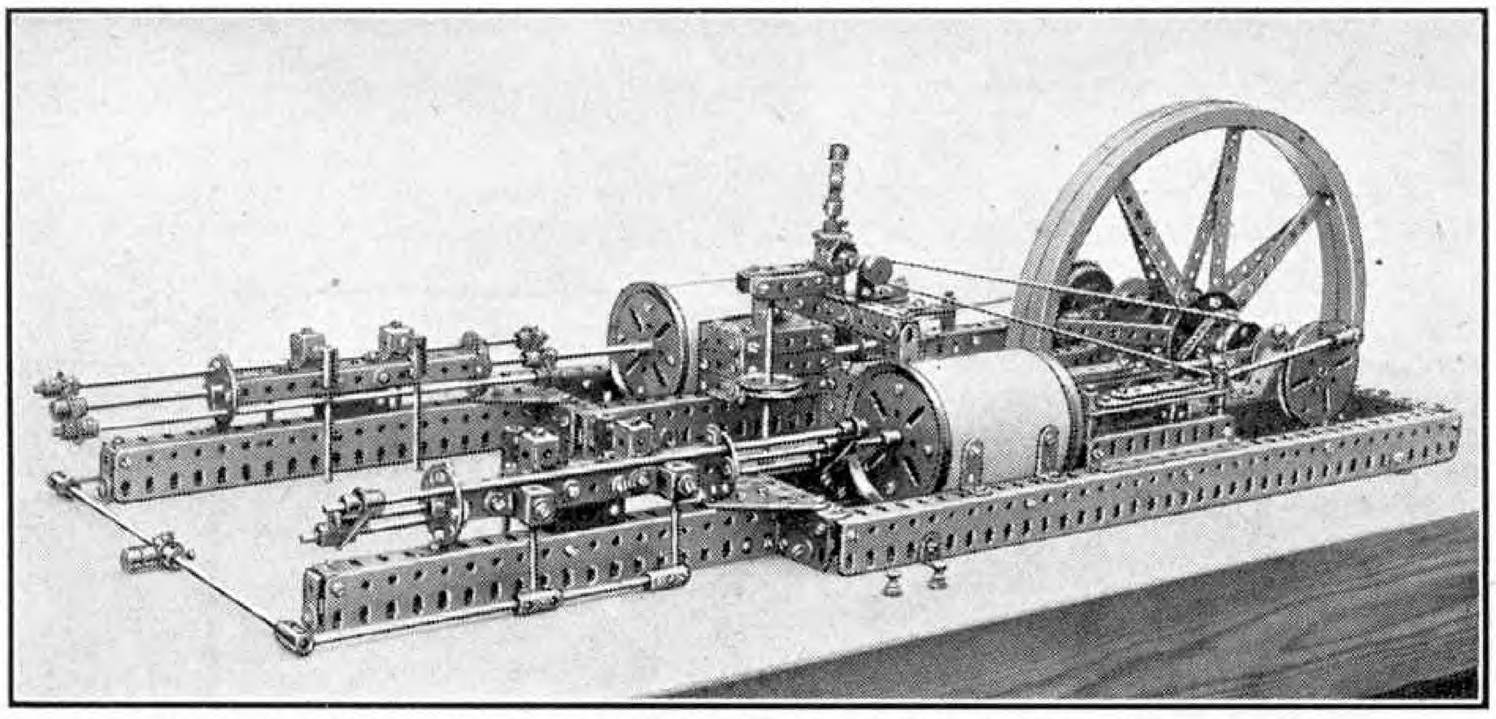


Fig. 3. A realistic model of a steam-hydraulic engine built by E. H. Bradshaw, Sheffield.

Locomotives of course are great favourites, and many splendid Meccano models of well-known and interesting engines have been described in the "*M.M.*" Model-builders rarely construct models of railway wagons and coaches, however. Yet the reproduction of these is a fascinating form of model-building, and the many improvements that take place in the design of rolling stock of modern railways provide a never-ending source of fresh inspiration for models. There is ample material in the handsome modern streamlined coaches, and the dining cars of famous long-distance expresses. Brake vans and the many types of special goods wagons also can be reproduced effectively.

The parts possessed by the average model-builder are generally sufficient to construct several models on a small scale so that a whole train of passenger or goods vehicles can readily be made up. Some enthusiasts may prefer to build one or two larger models, with a greater amount of detail in them. For instance, a passenger coach could be fitted inside with small tables, chairs and electric lights, and it would be a good plan to fit a sliding roof to such a model so that these interior details can be studied.

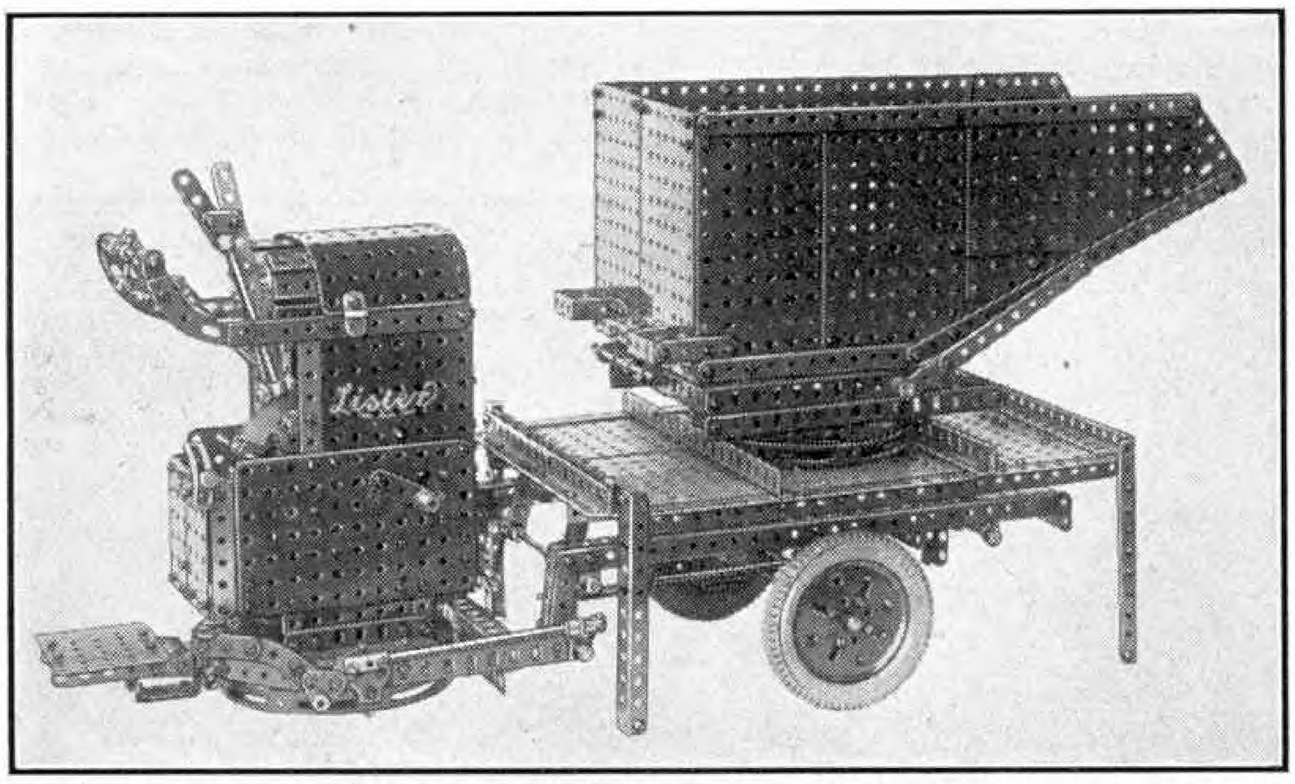


Fig. 4. This interesting model of the well-known Lister petrol-engined truck, reproduces all the details of the original. It was built by H. and R. Powell, Dursley.

Strips and Angle Girders are the most useful parts in constructing the bodywork of coaches and trucks, and Flexible Plates can be used effectively for the roofs. These parts have been used in the Meccano brake van and open truck illustrated in Fig. 1. These models are extremely realistic, although their construction is simple, for every detail is in the correct proportion. The axle boxes are neatly represented by Double Brackets fitted to 3" × 1½" Flat Plates, and 1" fast Pulleys are used for the buffers.

Railway stations form unusual but interesting subjects for Meccano models, and railway travel during the summer holidays presents a good opportunity for studying the different types of practice at the stations. Owners of small Outfits can take as their subjects one of the smaller country stations, which often have peculiarities that can be brought out well in a model. A more ambitious model of a roofed station with a number of platforms can be attempted by those who possess a larger stock of parts.

The fascination of motor-cycle models is easy to understand from Fig. 2, which is a reproduction of the B.S.A. "Blue Star." This model motor-cycle is one of the finest ever constructed in Meccano, and possesses several features that will be at once attractive and helpful to all interested in this form of model-building.

The inexperienced model-builder should not attempt to build a model similar to the one shown in Fig. 2 right away. The best plan is to attempt first of all one of the more simple single-cylinder types of motor-cycle. It will be found that Strips or Rods are useful for building up the frame and forks, while Strips curved to the correct shape can be made to represent the petrol tank. A Flat Trunnion attached to the rear of the tank can be used as a saddle in a simple model. The engine cylinders can be built up by fastening a number of 1" loose Pulleys on short Rods, or alternatively, by Chimney Adaptors and ½" fast Pulleys.

After a certain amount of experience has been gained in this manner, the model-builder may go on to the more complicated types of machines, such as a twin-cylinder high-power motor-cycle, or even one of the four-cylinder machines used for side-car work. In these larger models there is more detailed work. The model B.S.A. cycle of Fig. 2 is fitted with headlights, number plates and knee pads on the petrol tank, and it actually incorporates front and rear wheel hub brakes, which are operated by means of levers on the handlebars. The brake drums are formed by two Wheel Flanges, and Pawls are used as levers to operate the brake shoes. The twin exhaust pipes are constructed from Washers and Rods.

The model-builder who has constructed a satisfactory motor-cycle and is looking for other fields to conquer will find it good fun to build a machine with sidecar. The shape of the sidecar depends on the wishes of the designer, but boat-shaped bodies are generally the easiest to produce.

Loading Bananas in Brazil

The Busy Port of Santos

By A. C. Gee

"PILOT'S coming aboard, Sir."

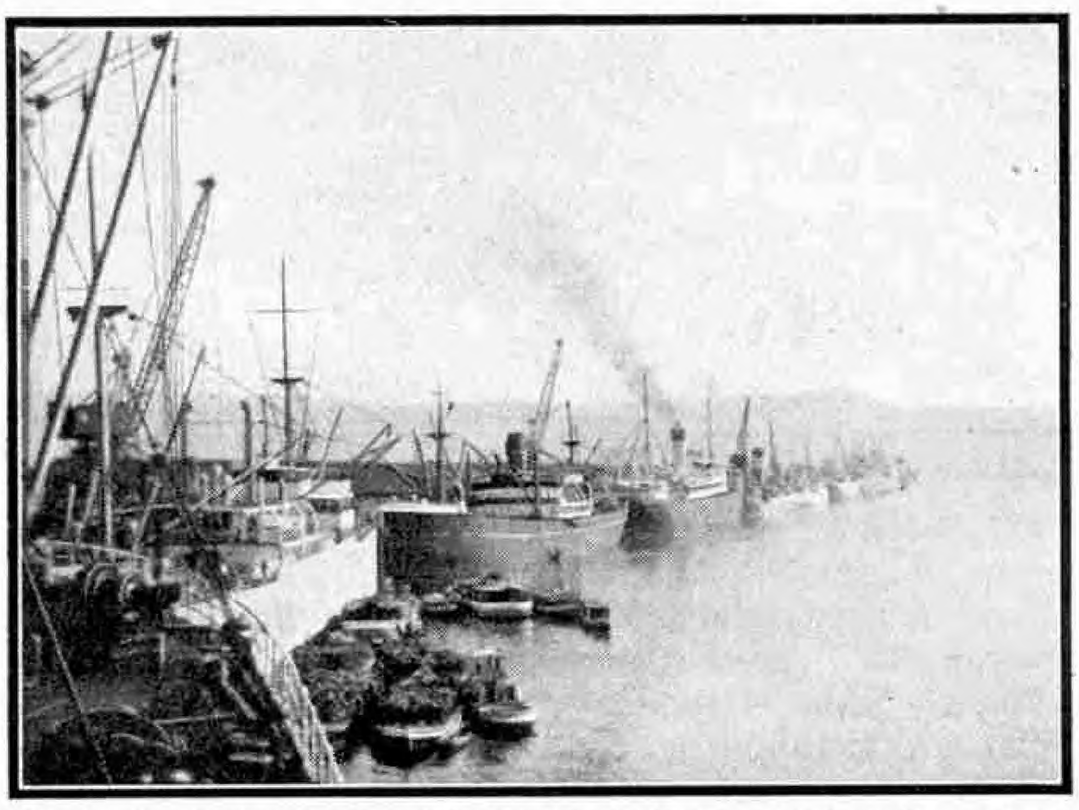
Sitting up and rubbing my eyes I awoke to find the quartermaster, clad in dripping wet oilskins, standing in my cabin doorway.

"What, is it raining?" I enquired.

"Aye Sir. Always rains 'ere. Comes down from the mountains."

The evening before, we had been standing on deck under a bright starlit sky, with a full moon shining down on the mountainous coastline. Every now and then a lighthouse, perched high up on a rocky headland, winked out its guiding light. It had seemed impossible that the next morning should prove wet. I had asked to be called when the pilot came aboard so that I should not miss the fun of making port.

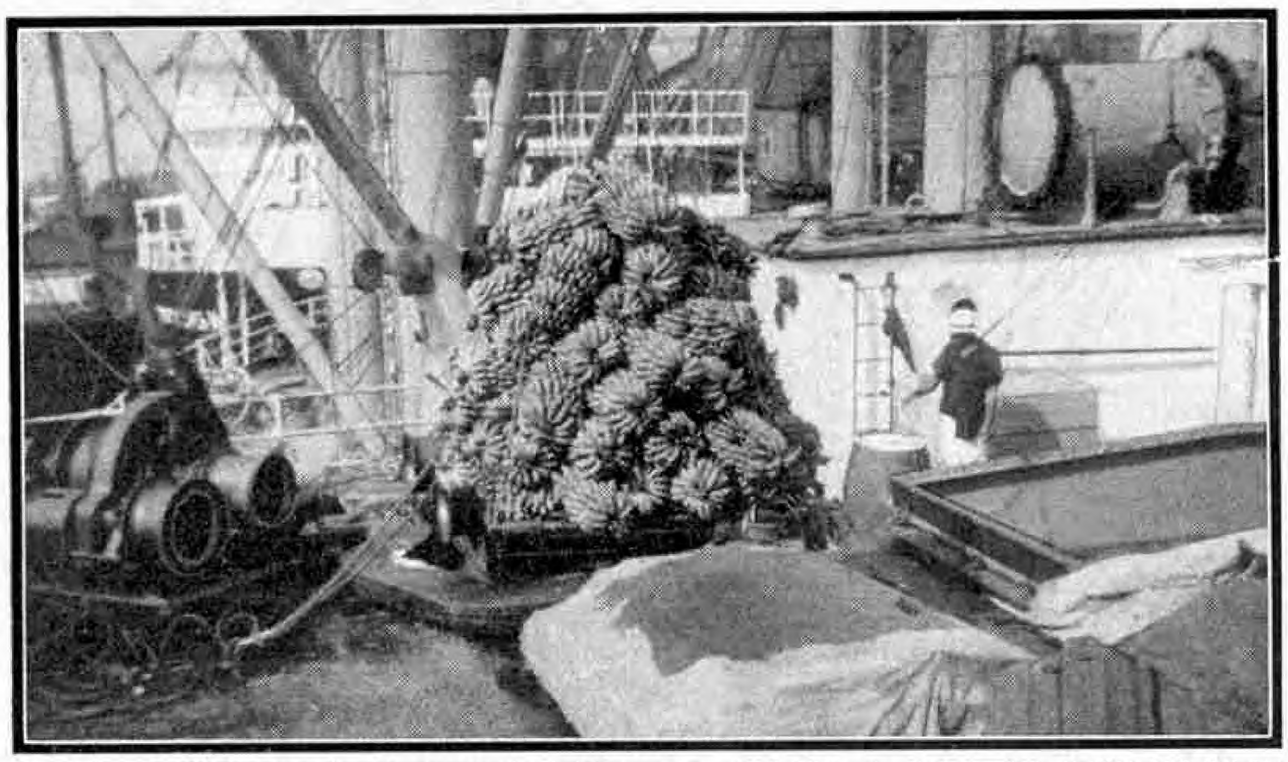
I hurriedly dressed and went up on deck. It was about five o'clock and still dark, and it certainly was raining. Taking shelter under the bridge, I leaned over the rail and watched the pilot boat. The sea was too rough for it to be made fast, so as it came slowly alongside the pilot made a carefully-timed grab at the rope ladder lowered for him, swung himself clear of his launch and clambered up. Once he was aboard, our engines were restarted and we steamed slowly up the river.



Ships loading fruit and coffee at Santos. The loading is done from the quay and from barges alongside the vessels.

This was my first visit to Santos. I had heard quite a lot about the port, which is one of the chief outlets of the great fruit and coffee growing district of Brazil. We were going to load a cargo of bananas to take down to Buenos Aires, where they are turned into oil, fats, soap, candles, lampblack, mats and many other products of industrial chemistry.

It was still quite dark. The buoys marking the channel up the river blinked their red or white flashes at us as we steamed slowly up the river, which has some very sharp bends in it. On one side the mountains rose up majestically to disappear in the gloom of a dull dawn; on the other side lay Santos, built on land that at one time had been mosquito-infested swamp. Now there were streets of quaint houses, their outlines only just visible in the early morning light. The street lamps were still on, and as we approached the harbour there came into view a long line of steamships lit up by great floodlights. Loading cargo goes on night and day in Santos, and at night powerful lights are suspended over the holds so that the work can go on uninterruptedly. A siren sounded and was answered by a blast from us, and the long dark form of an out-going boat slipped past us, homeward bound.



Loading operations in full swing. Bunches of bananas piled high on one of the cradles hoisted by the ship's derricks from barges. The bananas are stowed in refrigerated holds.

As the dawn broke more details became visible. Tied up alongside many of the boats were barges laden with bright green bananas, and scantily clad men worked unheeding in the rain, loading bunch after bunch into cradles suspended from the ships' derricks. When full the cradles were hoisted up, swung round, and lowered into the refrigerated holds, which are kept cold to prevent the bananas that are stored in them from ripening and rotting.

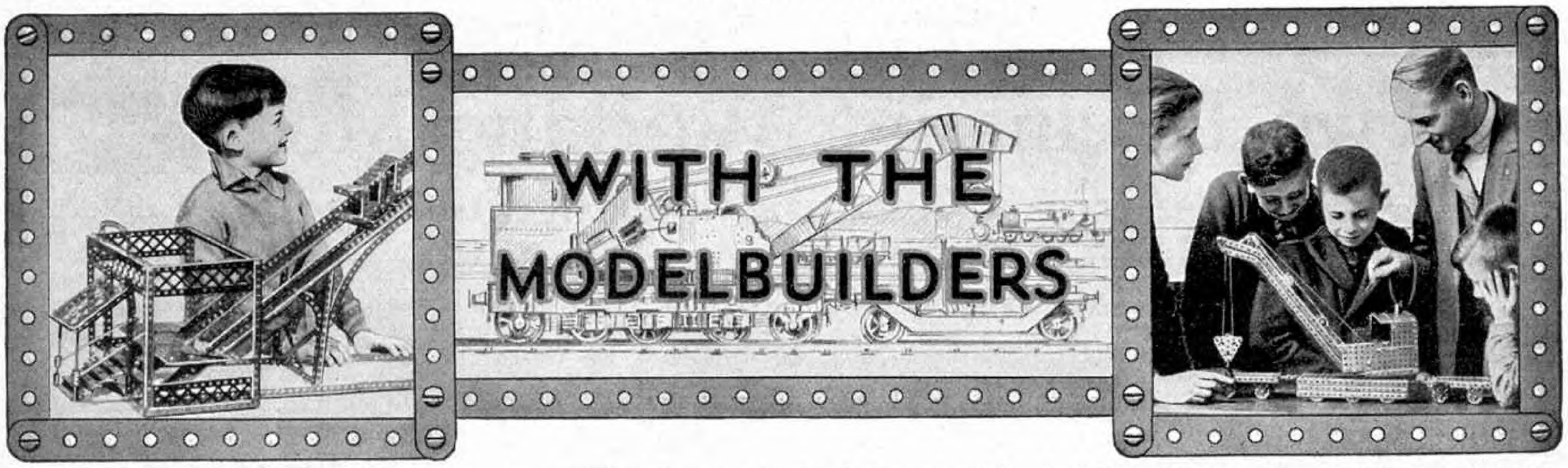
We steamed slowly past the long line of ships until we came to a vacant berth. With much shouting and sounding of sirens, two tugs appeared from nowhere and nosed us into our berth. At last we were close enough for hawsers to be passed ashore, and soon our ship lay quietly alongside the quay in line with the rest.

As soon as we were properly fast, a gang of negro stevedores came swarming aboard. Each one carried an umbrella with which he endeavoured to protect his somewhat scanty ragged clothing from the torrential downpour. A string of barges laden with bananas tied up alongside us and immediately our hatch covers were off loading began. Before long the ship reverberated with the din of rattling steam winches. On the river side bananas were hauled up out of the barges; on the quay side a long train of white banana vans drew up. Doors were thrown open and revealed more bunches of bananas, which were loaded on to conveyors, brought up to our deck level, and stowed away in our holds. We were not staying long, and 60,000 bunches of bananas had to be loaded as soon as possible.

After breakfast I took the opportunity to slip ashore and see a little of the town. The most interesting feature was a small "plaza," a charming little grass-covered square in the centre, with tall palm trees and a shady avenue beneath which are rows of seats. I was surprised to find in one corner a statue to a pioneer in aerial navigation. Padre Lourenco de Guanao who, although he did most of his early balloon ascents in Paris, was a native of Santos.

My walk eventually brought me back to the Quay, a very fine one built along the town side of the river bank only. It is about two miles long, and all the way along it were ships from all parts of the world, each one loading bunches of bananas, cases of oranges or sacks of coffee. There were some very fine ships there. One of them, a lovely sleek white-hulled Norwegian motorship, was particularly attractive and looked more like a large motor yacht than a cargo boat.

The "Blue Peter" was now flying from my own ship, and the last of the cargo was being stowed. Late that night the last trainload of bananas was emptied, and as the little tank locomotive that shunts the vans bade us farewell with a long wailing blast from her whistle, we slipped out into the open sea again and set course for Buenos Aires. As the ship moved down the river, I had a good view of the great mountain of rock rising up behind the town. On top of it is a hotel and the coastguard station. There was once a hospital there, but the ground beneath it gave way during a landslide and the building crashed down, to be buried beneath tons of earth and rock.



MECCANO AIDS TO PHOTOGRAPHERS

Photography is one of the many hobbies in which Meccano has been put to good use, both in the fitting out of a dark room and in making gadgets to assist in outdoor and indoor photography.

Of the many examples of dark room apparatus assembled with the aid of a few Meccano parts, the most outstanding is the enlarging apparatus constructed by H. Mees, Bradford. This consists of a box built up on a framework of Angle Girders, in which an electric light bulb and the condenser lens are mounted. The bulb holder is fastened on a wooden baseboard that can be racked along slides made from Angle Girders in order to bring the light into focus. The sides of the box are of thin plywood and are bolted to a long baseboard.

The enlarging lens is one taken from an old plate camera. It is fitted with slides. The mount can be racked to and fro for focussing purposes, and is connected by home-made bellows to another frame of Angle Girders fixed in front of the condenser lens, where provision is made for sliding the negatives to be enlarged into position. The screen on which the enlarged image is projected also is supported by Angle Girders, and this too can be racked along slides, while provision is made for moving it sideways and up and down. White cardboard is pasted to the screen and on it are ruled rectangles to represent areas of quarter-plate, postcard and half-plate sizes. A sheet of glass fitted in the frame holds the sensitised paper in position.

Other dark room apparatus built of Meccano includes an interesting but simple gadget designed by L. Johnson, Birmingham, for facilitating the development of roll films. It is a roller that can be clamped to the side of the developing dish so that the film can be passed round it. The roller itself is immersed in the solution. It consists of an ordinary film spool held on a Rod with Collars, the Rod being supported at one end in the boss of a Crank bolted to a clip formed from Strips that fits over the edge of the dish.

G. Lucas, Shrewsbury, has designed a neat Meccano stand for his camera. This can be clamped in almost any position, and is of particular value for providing a steady base when making time exposures in awkward places.

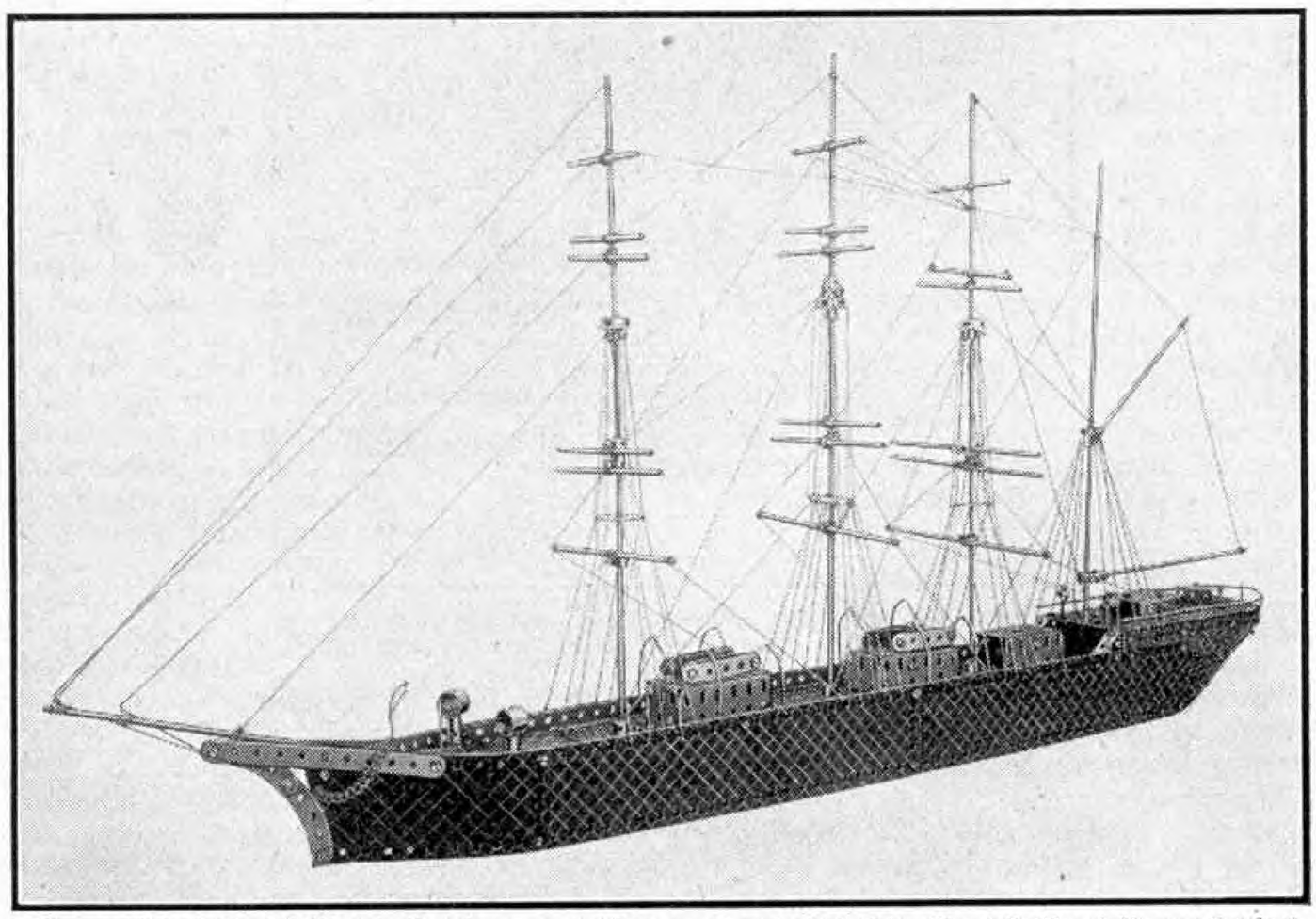
A $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate forms the rest for the camera, and to its centre is bolted a Double Arm Crank. A short Rod is locked in the boss of the Crank, and at its end carries a Coupling that is fitted between the arms of a small Fork Piece, a 1" Screwed Rod forming the connection. With this arrangement the arms of the Fork Piece can be clamped tightly to the Coupling. A second Rod in the boss of the Fork Piece carries jaws made from Strips at its end. These are also fitted with a screw attachment so that they can be clamped to some support, such as a fence, branch or chair back. The use of the Fork Piece allows the platform to be placed always in a horizontal position.

MECCANO BELT PULLEYS

One of the simplest methods of transmitting a drive from one part of a model to another is by using Meccano Cord or Driving Bands, with Pulleys of different sizes to give the required speed changes. In building certain types of models, such as miniature factories and steam engine plant, a realistic effect can be achieved by incorporating flat belt pulleys and belts.

Good belt pulleys can be made of $1\frac{1}{8}''$ or $\frac{3}{4}''$ Flanged Wheels, butted together in pairs, and the Flywheel, Part No. 132, is ideal where pulleys of large diameter are required. There are a number of other parts equally suited for this purpose, however, and B. Brown, Kettering, makes the interesting suggestion that the Boiler End should be used. In diameter this is intermediate between the $1\frac{1}{8}''$ Flanged Wheel and the Flywheel, and it can be bolted to a Bush Wheel or Double Arm Crank for mounting on a shaft. Two Wheel Flanges butted together and bolted to a Bush Wheel also form a useful pulley, which is slightly larger in diameter than the Boiler End but is more solid in appearance, and if very large pulleys are required, Hub Discs can be employed.

It is not a difficult matter to make satisfactory flat belts for use with these pulleys. Canvas forms the best material and can easily be cut into strips of suitable width, which can be stitched or wired together. An alternative material is rubber, which can be obtained from the inner tube of an old motor or bicycle tyre. A belt of rubber has the advantage of being able to grip the rim of the Pulley around which it passes.



A fine model of the "California," a four-masted barque-rigged steel ship. The "California" was the last and largest of the sailing clippers owned by the White Star Company, and was built by Harland and Wolff, Belfast, in 1890. She was sold abroad in 1896, and then was re-named "Alster" and later "Christel Vinner." She was stranded in 1927 in the Caribbean Sea, and became a total wreck.

A NEAT UNIVERSAL COUPLING

G. Hodgson, Fulwood, York, recently sent me details of a novel built-up universal coupling that can be used as a substitute for the Meccano Part in certain instances. It consists essentially of two Double Brackets interlocked with each other, Collars being pivoted on bolts between the lugs. The shafts it is required to connect are gripped in the Collars by the bolts.

The coupling is efficient in operation, but can only be used where the shafts are slightly out of line.

LOOPING THE LOOP WITH DINKY TOYS

Model-Builders who are also keen Dinky Toys collectors will be interested in the novel game devised by N. Mitchell, Yarmouth. In this a runway with a vertical loop at the centre is used. This is made from Meccano parts. The roadway is supported by Angle Girders, and is paved with Flexible Plates clamped between Angle Brackets to avoid jutting bolt heads. The road to the loop forms a steep and high approach, but that leading out of it is horizontal, and Dinky Toys Motor Cars released at the top of the approach loop the loop in a most exciting manner.

A similar game can be played with Dinky Toys Aeroplanes, but in this case the runway is replaced by a length of Hornby Control Wire bent to a similar shape. A Dinky Toys Aeroplane is hung on the wire by the special Gliding Pin supplied with it. When the Aeroplane is released it glides down and loops the loop just like a real aeroplane.

There are many fascinating variations of these games, and I shall be pleased to hear from other model-builders who have been experimenting along similar lines.

PROPELLERS FOR MECCANO AEROPLANES

One of the most interesting aspects of model aeroplane construction is the design of a neat and realistic propeller, for the appearance of this part contributes greatly to the general effect. Many miniature aeroplanes built as scale models indeed are spoilt because their constructors have overlooked this important point.

A common mistake is to use a propeller that is too large for the model. This applies more particularly to small models, for which a Strip may be too wide in relation to its length, a Rod of suitable length gives a better effect. This can be fastened on the Rod representing the propeller shaft by passing it through the lug of a Rod and Strip Connector, and fixing it in position by means of Spring Clips or Cord Anchoring Springs. The Connector can then be fitted on the propeller shaft.

W. Harris, Bolton, has made a suggestion of special interest to builders of small models. He finds that the Propellers included in the Aeroplane Constructor range add the finishing touch to small model aeroplanes, especially if they are made to revolve when the model is pushed along the ground.

For models with a wing span of about 24 in. Meccano Propeller Blades are admirable, and they look neatest when bolted to a Double Arm Crank. The spinner can be represented by a $\frac{1}{2}''$ fast Pulley or a paper cone. Propellers for larger models are easily built up of straight and curved Strips of suitable length.

A good scheme for mounting propeller blades has been suggested by S. Cook, Nuneaton. A 1" Rod is locked in the end transverse bore of a Coupling, which is mounted on the propeller shaft, and Rod and Strip Connectors are pushed on to its ends. The blades can then be bolted to the lugs of the Rod and Strip Connectors, and twisted to give the required pitch.

SIMPLE STEERING GEAR FOR SMALL MOTOR VEHICLE MODELS

No matter how small a model vehicle may be, the builder always wishes to incorporate some form of steering mechanism. The simplest method of course is to pivot the front axle at its centre, but this does not conform with actual practice, and model-builders are keen to incorporate more realistic devices.

L. Bragg, Ilford, suggests a very neat and simple way out of the difficulty. A $\frac{3}{8}''$ Bolt is passed through the centre hole of a Double Bracket that forms bearings for one of the front stub axles, and two Flat Brackets are placed on its shank. The parts are then locked together by a nut so that the Flat Brackets are at right-angles to the stub axle.

The shank of the $\frac{3}{8}''$ Bolt is then passed through a support on the model, and is retained in position by lock-nuts. When two of these stub-axle units have been attached, one to each side of the model, the steering column is fitted with its end protruding below the chassis between the axles. It is fitted at its lower end with a Cord Anchoring Spring, through which Cord is threaded. The Cord is wound round the Rod, and tied to Flat Brackets on each stub axle unit. The remaining Flat Brackets also are joined by Cord.

Two Fascinating Working Models

An Anti-Aircraft Gun and a Designing Machine

THIS month we are describing working models of an anti-aircraft gun and a harmonograph, each of which can be built with a No. 5 or larger Outfit. The harmonograph is capable of producing innumerable intricate designs, such as the two illustrated in Figs. 3 and 4, and watching the machine trace out these designs is a fascinating pastime at which many hours can be spent. The anti-aircraft gun fires Washers or Collars, and can be swivelled and elevated like a real gun.

The base of the gun, which can be seen in Fig. 1, is constructed first. It consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate to which two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates are bolted. The sides of the base are filled in by $5\frac{1}{2}''$ Strips that are fastened in position by Angle Brackets. A 3″ Pulley is next bolted to the centre of the base, and around it two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates 10 are fastened. The Flexible Plates are not attached to the 3″ Pulley, but it will be found that if the Plates are bolted together tightly they will grip the rim of the Pulley firmly. A 2″ Rod, which forms a swivel for the superstructure of the gun, is locked vertically in the boss of the 3″ Pulley and is further supported by the centre hole of a Double Bent Strip secured by two $\frac{1}{2}''$ Bolts to the base. Each Bolt carries four Washers on its shank to space the Double Bent Strip upwards.

At its upper end the 2″ Rod carries a second 3″ Pulley, which is spaced from the Double Bent Strip by a 1″ fast Pulley. Two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates 11 are mounted on the 3″ Pulley by a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip and these are braced on their inner sides by $2\frac{1}{2}''$ Strips. Two $2\frac{1}{2}''$ small radius Curved Strips are also bolted to the Flexible Plates, as shown in Fig. 1, to form the supporting arms for the gun barrel. The front of the turret is filled in by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate 12, which is fastened in position by three Angle Brackets, and is extended upward by a Flat Trunnion.

The firing platform of the gun is formed by a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate mounted on two $5\frac{1}{2}''$ Strips bolted to the 3″ Pulley.

The remaining portion of the model to be constructed is the gun itself. This is shown partially dismantled in Fig. 2. The barrel consists of two $12\frac{1}{2}''$ Angle Girders 1, which are joined together at 2, in Fig. 1, and 3 by two Double Brackets. At this stage in the construction of the model, however, the Double Brackets are only bolted to one of the Angle Girders, the other Girder being fitted later when the firing mechanism has been assembled. A $9\frac{1}{2}''$ compound rod, built up of a 5″ and a $4\frac{1}{2}''$ Rod joined by a Rod Connector, is journalled in the centre holes of the Double Brackets and it carries at its forward end a Cord Anchoring Spring. This is pressed on the rod about half an inch from the muzzle end to form a stop for the Washer or Collar used as a missile. A Washer is fitted on to the rod just behind the Rod Connector, and around this the end of a 6″ Driving Band is looped. The other end of the Driving Band is passed through the hole in the lower Angle Girder directly behind the front Double Bracket, and is anchored to a bolt secured at the extreme forward end of the barrel.

A handle 4 is provided at the rear of the $9\frac{1}{2}''$ rod to enable it to be pulled back preparatory to firing. The handle consists of a $1\frac{1}{2}''$ Strip and is attached by an Obtuse Angle Bracket to a Rod and Strip Connector on the end of the compound rod. The bolt attaching the Obtuse Angle Bracket to the Rod and Strip Connector carries three Washers on its shank, so that it does not catch against the sides of the barrel.

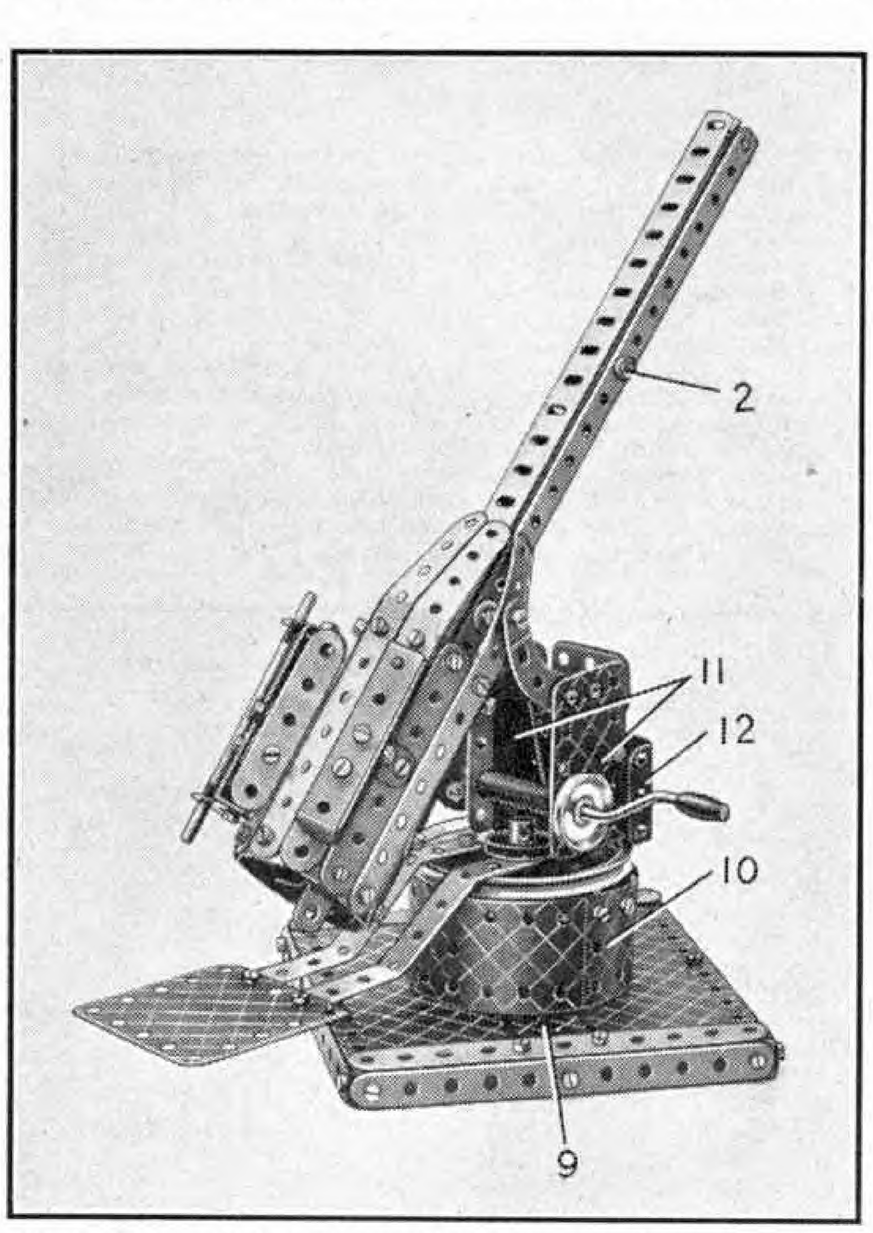


Fig. 1. A fine model of an anti-aircraft gun that shoots Washers or Collars. It is built up of parts included in Meccano Outfit No. 5.

The firing catch, which holds the $1\frac{1}{2}''$ Strip in its rearmost position until it is required to fire the gun, consists of a Threaded Pin 7. This slips down in front of the Rod and Strip Connector on the end of the $9\frac{1}{2}''$ rod, and prevents it from shooting forward under the action of the Driving Band. The Threaded Pin can be raised by a lever 5, which consists of a $2\frac{1}{2}''$ and a $1\frac{1}{2}''$ Strip bolted together overlapping two holes. The lever is lock-nutted at its end to a Flat Bracket bolted to the side of the barrel, and the Threaded Pin is secured to it by an Angle Bracket 6 and a Flat Bracket.

The wider portion of the barrel is built up on two $5\frac{1}{2}''$ Strips, each of which is carefully bent into the form of a circle and has its ends joined together by an Obtuse Angle Bracket. Further Strips of different sizes are then bolted between the two $5\frac{1}{2}''$ Strips, as shown in the illustration, and the complete unit is then pushed on to the end of the $12\frac{1}{2}''$ Angle Girders and fastened in position by a Double Bracket 8.

There are two recoil shock absorbers, each consisting of a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip and two $2\frac{1}{2}''$ Strips joined by Angle Brackets, and they are mounted on the barrel by means of two Reversed Angle Brackets. One of the shock absorbers is fitted with a sight, which is represented by a $3\frac{1}{2}''$ Rod journalled in two Flat Brackets bolted to the ends of the Double Angle Strip.

This completes the barrel of the gun, and it can now be fitted on the mounting. This is done by fastening two bolts through the end holes of the Curved Strips bolted to Plates 11, in Fig. 1, so that they form swivels on which the barrel can rest. The elevation of the barrel is controlled by a Crank Handle journalled in Flexible Plate 11. Cord is tied to the Crank Handle, wound around it several times, and its other end attached to the barrel just in front of the pivot. Turning the Crank Handle in one direction pulls down the muzzle of the gun, and the weight of the butt end swings the gun to increase the elevation when the movement of the Handle is reversed. Two 1″ Pulleys fixed on the Crank Handle press tightly against the Flexible Plates 11 so that the gun does not turn too easily and is held in any desired position.

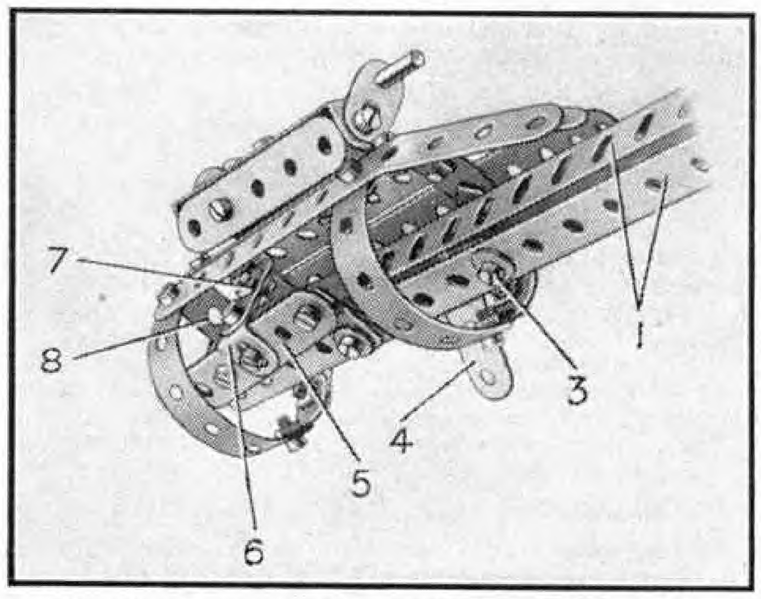


Fig. 2. The construction of the barrel of the gun.

Parts required to build model anti-aircraft gun: 14 of No. 2; 2 of No. 3; 12 of No. 5; 2 of No. 6a; 2 of No. 8; 6 of No. 10; 3 of No. 11; 12 of No. 12; 3 of No. 12c; 1 of No. 15; 1 of No. 15a; 1 of No. 16; 1 of No. 17; 2 of No. 19b; 1 of No. 19g; 3 of No. 22; 2 of No. 35; 87 of No. 37a; 82 of No. 37b; 14 of No. 38; 1 of No. 40; 1 of No. 45; 1 of No. 48; 2 of No. 48a; 1 of No. 51; 1 of No. 52; 2 of No. 90a; 2 of No. 111a; 1 of No. 111c; 1 of No. 115; 2 of No. 125; 1 of No. 126a; 1 of No. 176; 1 of No. 186a; 2 of No. 188; 2 of No. 189; 1 of No. 190; 2 of No. 192; 1 of No. 212; 1 of No. 213.

The harmonograph is seen in operation in Fig. 5. It consists of a pendulum that carries a table at its upper end and is mounted so that it is free to swing in any direction. A pen suspended above the table then traces out a design on a piece of card attached to the table. The addition of a second pendulum to the lower end of the first one makes the designs produced by the machine more intricate.

The base of the harmonograph is a box-shaped structure built by joining the ends of two $12\frac{1}{2}''$ Angle Girders by $5\frac{1}{2}''$ Strips. Four $2\frac{1}{2}''$ Strips are bolted vertically to the ends of the Angle Girders; the

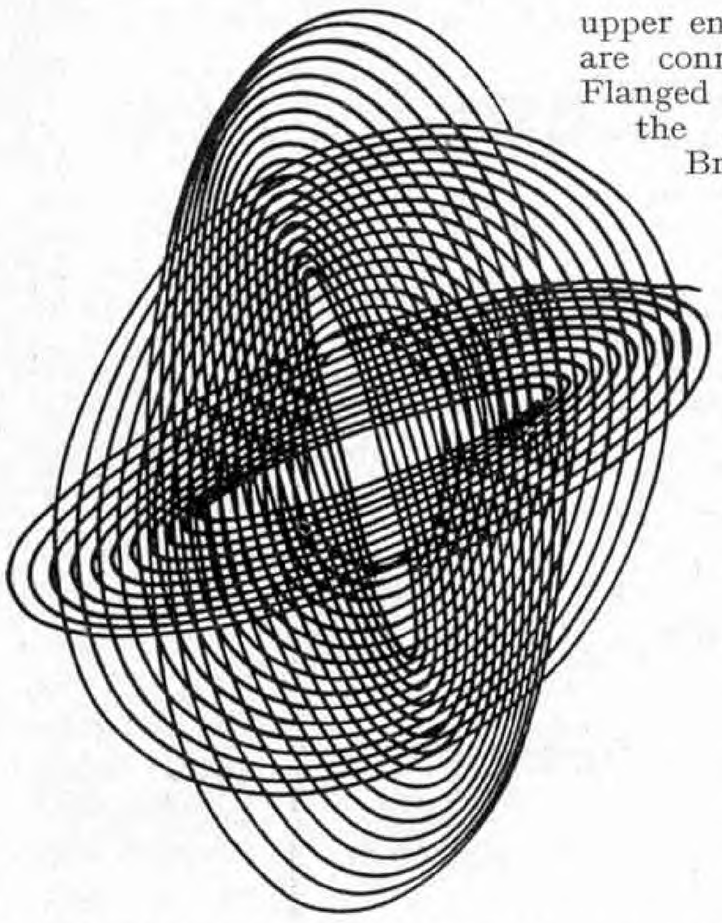


Fig. 3. A design produced by the harmonograph, using a single pendulum.

Two $12\frac{1}{2}''$ Angle Girders 2 are bolted to the base in the positions shown, and to them two Flat Trunnions 3 and 4 are fastened, each bolt carrying two Washers on its shank between the Flat Trunnions and Angle Girders. Reversed Angle Brackets, one of which is shown at 7, are then bolted to the inner sides of the Flat Trunnions, and through the free end hole of each Bracket a bolt is fastened to form the supports for the swivel frame 5, which is constructed by joining two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips by $1\frac{1}{2}''$ Strips. Two $3''$ Screwed Rods passed through the centre holes of the $1\frac{1}{2}''$ Strips are screwed into the boss of a $1''$ Pulley 6, which holds a $5''$ Rod.

This Rod is joined to the pendulum at its lower end by a Rod and Strip Connector. The pendulum consists of three $12\frac{1}{2}''$ Strips and a $5\frac{1}{2}''$ Strip bolted end to end, and is weighted at the bottom by two $2\frac{1}{2}''$ Semi-Circular Plates and four $2\frac{1}{2}''$ small radius Curved Strips. An extra weight is added in the form of two Flanged Sector Plates, to the inner sides of which six $5\frac{1}{2}''$ Strips and eight $2\frac{1}{2}''$ Strips are bolted. The second pendulum is made by fastening two Road Wheels and two $3''$ Pulleys on a $3\frac{1}{2}''$ Rod, and attaching this unit to the lower end of the main pendulum by a length of Cord.

The designs are drawn on sheets of paper pinned down on the Table, Part No. 107, which is of wood and is 6 in. square. A Bush Wheel carrying a $5''$ Rod in its boss is screwed to its underside, and the $5''$ Rod is joined by a Rod Connector to the upper end of the $5''$ Rod held in Pulley 6. If desired the Hinged Flat Plate included in the Outfit can be used as a table by fastening it to the Bush Wheel by two Double Brackets. It is not as steady as the wooden Table, however, and does not produce such good results. The paper used should be of good quality and have an even surface. Rough paper and also paper with a highly finished surface should not be used, as it absorbs the ink.

The support for the pen arm consists of two compound strips 10, each comprising two $5\frac{1}{2}''$ Strips overlapping four holes, which are upper ends of the forward pair are connected by a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 1, and those of the rear pair by Angle Brackets and a $5\frac{1}{2}''$ Strip. Two $12\frac{1}{2}''$ Strips are also bolted between the shorter flanges of Plate 1 and the rear $2\frac{1}{2}''$ Strips. Each side of the base is filled in by two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates and one $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate, which are bolted between the $12\frac{1}{2}''$ Strips and Angle Girders. The top of the base consists of two $4\frac{1}{2}'' \times 2\frac{1}{2}''$ and two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates, together with one $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate. These are arranged as shown in the illustration and supported at the sides by Angle Brackets.

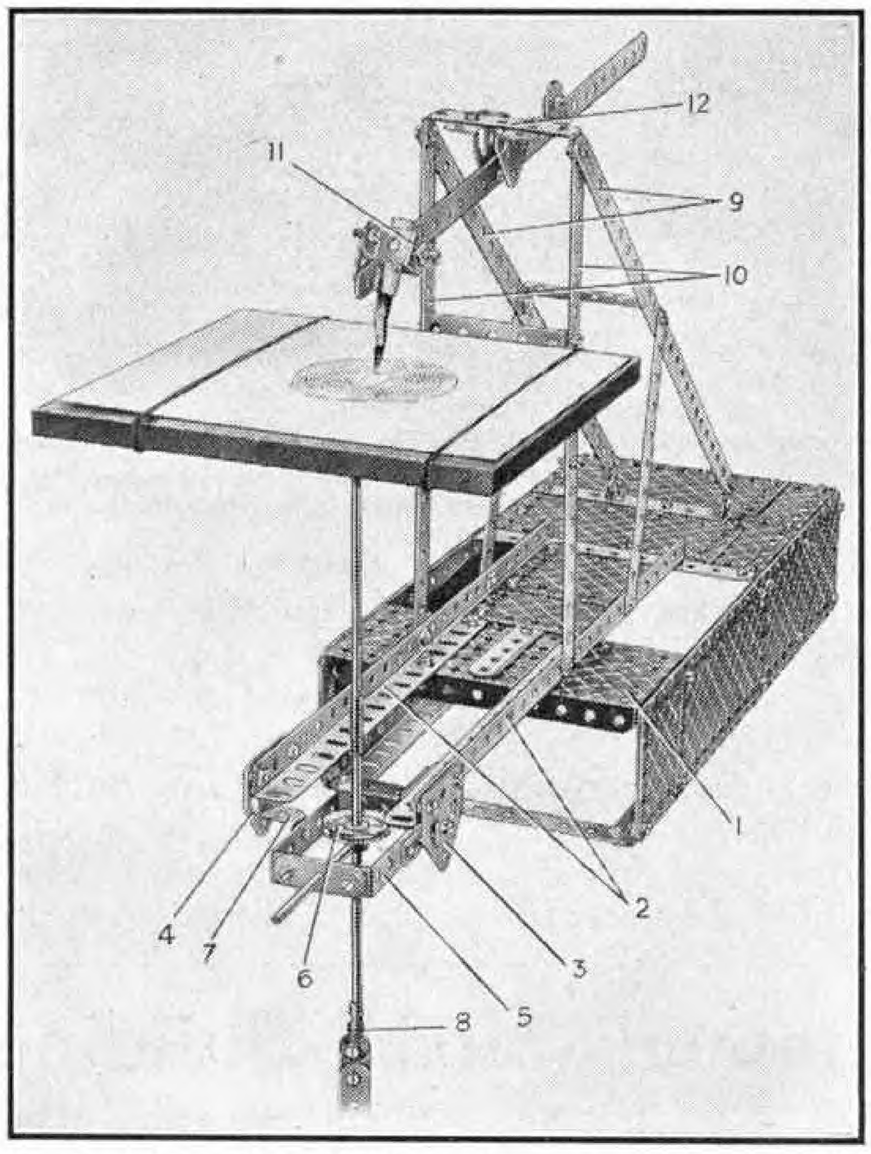


Fig. 5. This No. 5 Outfit Model of an harmonograph is easy to build if the instructions on this page are followed.

secured to the Girders 2. The Strips 10 are joined at their upper ends by Double Angle Strip 12, the bolts holding also two $12\frac{1}{2}''$ Strips 9. The lower ends of the $12\frac{1}{2}''$ Strips are fastened by a further $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip to the base of the model. The pen arm is a $12\frac{1}{2}''$ Strip and is pivotally attached, by a lock-nutted bolt in the eleventh hole from its forward end, to a Trunnion that is bolted underneath the Double Angle Strip 12. A second Trunnion is added to balance the first. For the pen a piece of glass tubing $\frac{1}{4}''$ in diameter and $6''$ in length is used. This is held with its centre in a gas flame, rotating it to give even heating, until the glass is soft, and its ends are then drawn steadily apart until only a very thin portion is left in the centre. The glass is then cooled and snapped at the tapered portion. If this is done carefully, two short lengths of tubing, each with a very fine hole at one end, will be obtained. These can be loaded, one with red ink and the other with black ink, so that designs in two colours can be obtained. If no glass tubing is available, a fountain pen can be substituted.

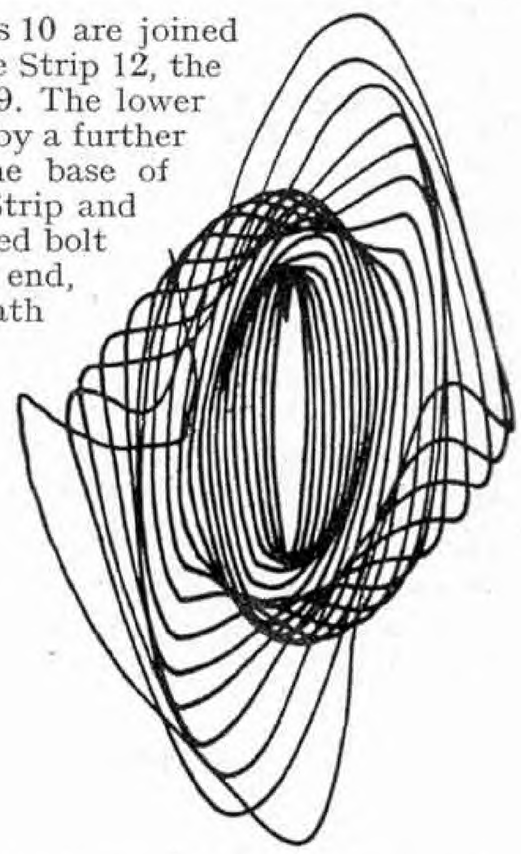


Fig. 4. A more intricate harmonograph design. A compound pendulum was used.

The pen holder is formed by a Double Bent Strip 11, one end of which is bolted to the pen arm. The other end of the Double Bent Strip is prevented from springing outward by a Flat Bracket, which is positioned as shown in Fig. 5. The Double Bent Strip is provided with a lock-nutted $\frac{1}{2}''$ Bolt in its centre hole to grip the pen.

The pressure of the pen on the paper is adjusted by a balance weight, which is moved along the arm until the pen just rests lightly on the paper. The weight consists of two $\frac{3}{4}''$ Discs clamped by a bolt to the $12\frac{1}{2}''$ Strip, but this is not heavy enough if a fountain pen is substituted for the glass pen. In this case two $1''$ Pulleys fastened on a Rod passed through a hole in the $12\frac{1}{2}''$ Strip should be used.

Of the two designs illustrated on this page the one shown in Fig. 3 was made using a single pendulum, and superimposing three circular patterns one on top of the other to give a fine watered-silk effect. The design shown in Fig. 4 was made using a double pendulum, and by varying the movement of the two pendulums in relation to one another, it is possible to produce many other attractive patterns. Very interesting effects can also be obtained by superimposing a design produced by a double pendulum upon one produced by a single pendulum.

Patterns in which the lines are closer together can be traced by adding extra weights to the pendulums, which then also swing more steadily. Another way of introducing variety into the designs that are produced by the harmonograph is to vary the weights on the two pendulums, increasing the load on one and slightly decreasing that on the other.

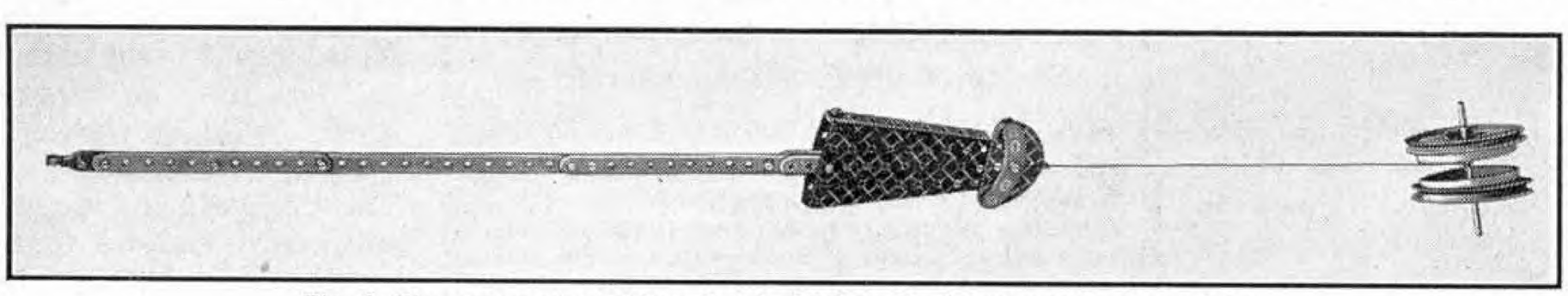


Fig. 6. The compound pendulum that is fitted to the harmonograph shown above.

Parts required to build model harmonograph: 9 of No. 1; 14 of No. 2; 12 of No. 5; 2 of No. 6a; 4 of No. 8; 3 of No. 10; 9 of No. 12; 2 of No. 15; 2 of No. 19b; 1 of No. 24; 91 of No. 37a; 85 of No. 37b; 14 of No. 38; 1 of No. 45; 1 of No. 52; 2 of No. 54a; 2 of No. 80c; 4 of No. 90a; 2 of No. 111a; 6 of No. 111c; 2 of No. 125; 2 of No. 126; 2 of No. 126a; 2 of No. 187; 1 of No. 188; 1 of No. 189; 4 of No. 190; 2 of No. 191; 4 of No. 192; 1 of No. 212; 1 of No. 213; 2 of No. 214; 2 of No. 217b.

Grand "Summer" Model-Building Competition

Bigger Prizes—Extended Closing Date

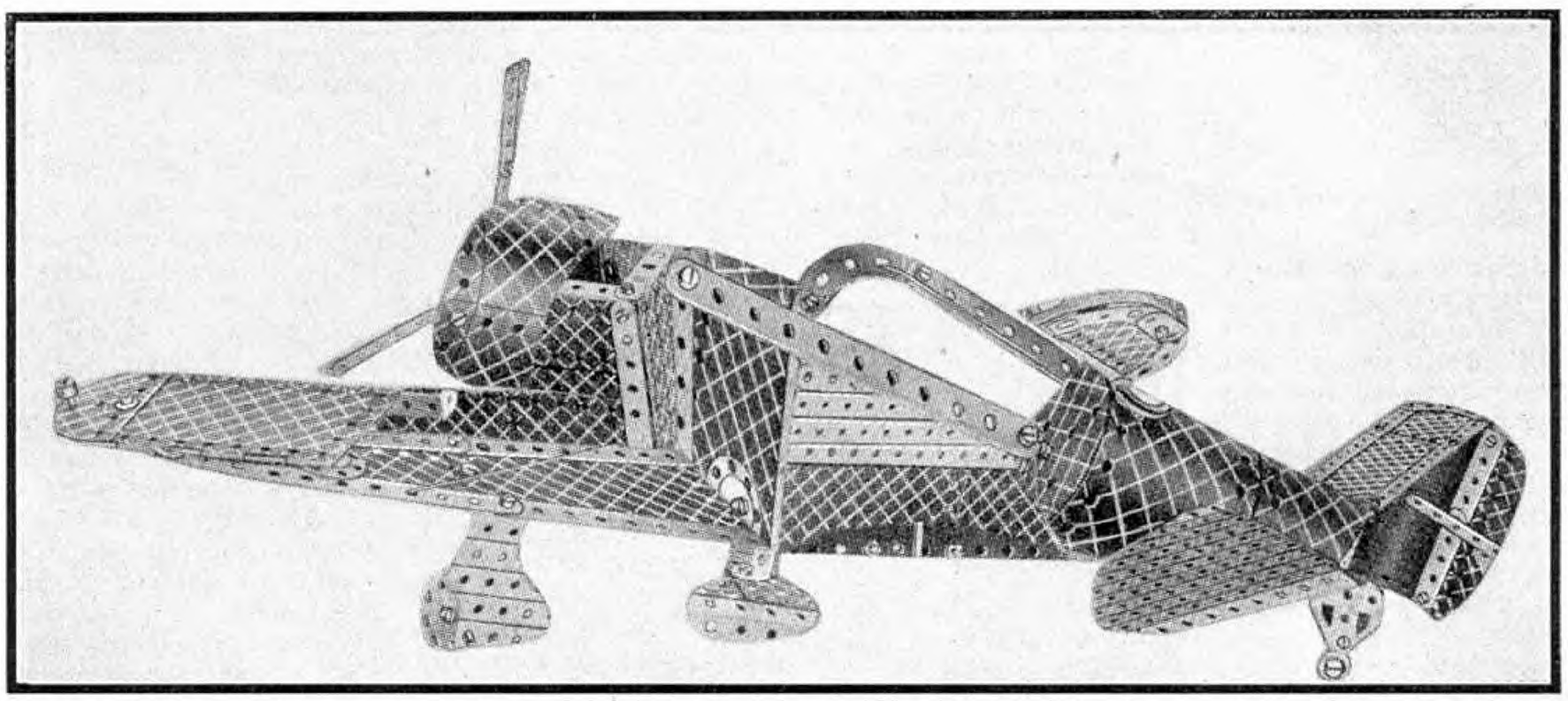
Third "Sharp Eyes" Contest

The fearsome model aeroplane shown in the illustration on this page is not real. It has been designed in connection with the third and last of the series of special summer "Sharp Eyes" Contests. Every reader can enter this competition, in which the parts of the picture have to be traced, no matter where he lives and whatever his age, but each is allowed only one attempt.

All that a competitor needs beyond his copy of the "*M.M.*" is the Instructions Manual for Outfit Nos. 0–6, a pencil and a postcard. Every model described in the Manual is illustrated, and from these pictures 20 separate pieces have been cut to make up the weird aeroplane. Competitors are asked to write down on a postcard the Manual numbers and names of the 20 models concerned.

Those who know the Manual for the smaller Meccano Outfits will have a good time sorting out the fragments and hunting through the illustrations for their sources. The type of part contained in a fragment will be a good guide, parts such as Cylinders and Angle Girders being used only in the larger models. The pieces are not necessarily placed the same way up in the illustration on this page as in the Manual illustrations, and competitors should be prepared even for their being upside down.

If no competitor succeeds in identifying all the pieces in the illustration, the prizes will be awarded in order of merit to the readers who send in the best attempts. If there is a tie, the prizes will be given to those whose entries are the most neatly and clearly prepared.



This picture of an aeroplane consists of 20 separate pieces cut from illustrations in the Instruction Manuals for Outfits No. 0-6. Prizes are offered to readers who can identify the illustrations from which the pieces are taken.

The prizes to be awarded are as follows: First, Meccano or Hornby products value £3/3/–; Second, products value £2/2/–; Third, products value £1/1/–. Five prizes of products value 10/–. Five prizes of products value 5/–.

The closing date for receipt of entries is 30th October 1938. Entries, which must be by postcard only, should be addressed "*Sharp Eyes Contest No. 3,*" Meccano Ltd., Binns Road, Liverpool 13.

Grand "Summer" Model-Building Contest

The first announcement of the Grand "Summer" Model-Building Contest appeared in the July issue of the Magazine, and many model-builders who read that number will now be hard at work putting the finishing touches to their models. The closing date of the competition is 30th September, and for the benefit of those readers who did not see the first announcement we are again giving full particulars.

This is the first of an entirely new series of competitions, in which larger prizes are offered than ever before. The competition is open to readers of all ages living in any part of the world, and everyone will have an equal chance of winning one of the splendid prizes, details of which are given in the accompanying panel. Any kind of model may be submitted, and any size of Outfit or quantity of parts may be used in building it. A simple well-built model, however, is far more likely to win a prize than a large scrappy-looking and rickety model, no matter how complicated its mechanism may be.

When the model is completed it is only necessary to obtain a good clear photograph of it or make a drawing, and forward it to "*Summer General Model-Building Contest,*" Meccano Ltd., Binns Road, Liverpool 13. The competitor's age, name and address should be written on the back of each photograph or drawing sent, and a brief description of the model also should be enclosed.

Neatly and strongly built models will have the best chance of success.

Grand "Summer" Model-Building Competition

Closing Date: 30th September 1938

FINE PRIZES THAT YOU CAN WIN!

First Prize, Meccano or Hornby products value £5/5/–.
Second Prize, Meccano or Hornby products value £3/3/–.
Third Prize, Meccano or Hornby products value £2/2/–.
Ten Prizes of Meccano or Hornby products value 10/6.
Certificates of Merit also will be awarded.

—

Every Reader Has an Equal Chance—
Send in Your Entry Now!

Model-Building Competition Results

By "Spanner"

"Winter" Contest (Home and Overseas Sections)

The principal prize-winners in the Home and Overseas Sections of the "Winter" Model-Building Competition, full details of which were announced in the February 1938 issue of the *"M.M."* are as follows:

Home Section

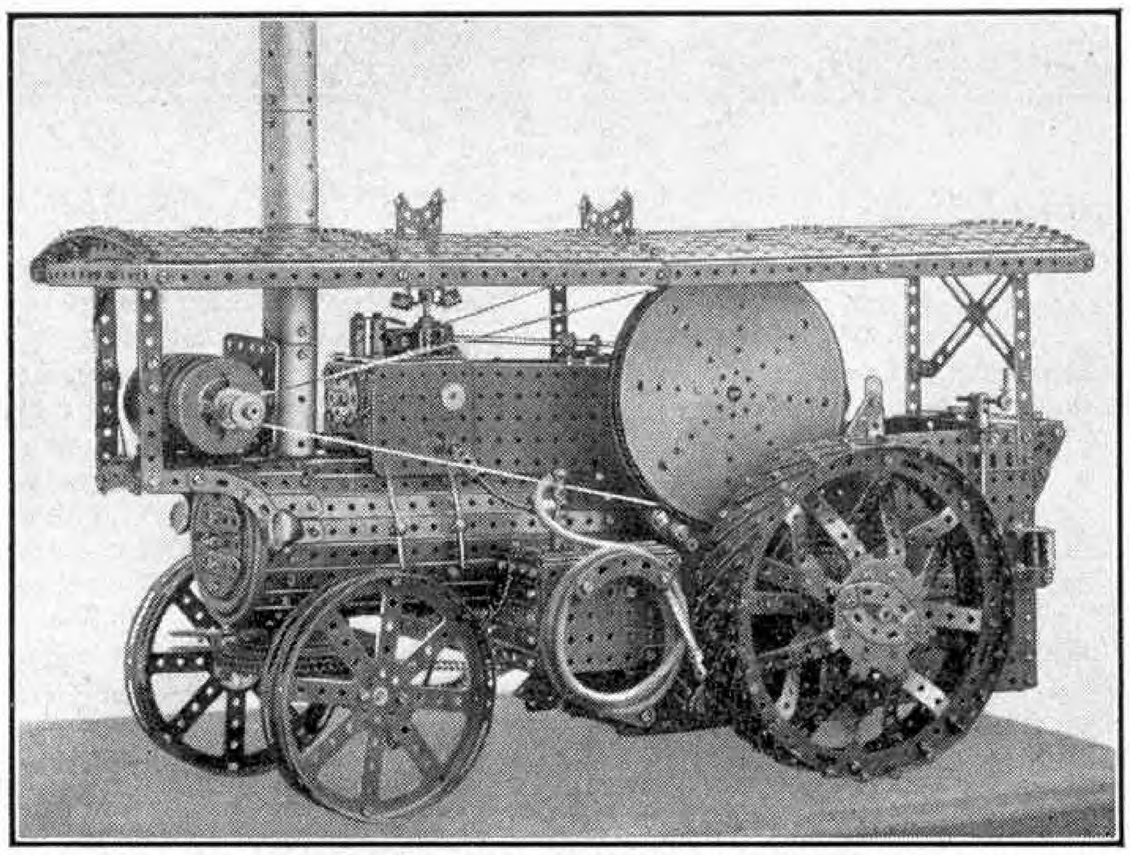
First Prize, Meccano or Hornby products value £3/3/–: C. H. Pendlebury, Hinckley. 2nd, products value £2/2/–: D. M. Davies, Maesteg. 3rd, products value £1/1/–: A. Foster, Bacup.

Products value 5/–: S. Fogg, Bristol; A. Dick, Brighton; S. F. Aiken, London S.W.15; J. Usher, Dundee; R. Moores, Leeds; P. Knowles, Cowes; H. Lee, Ardrossan; G. Parkyn, Barnet; E. Hill, Wolverhampton; C. Williams, Manchester.

Overseas Section

First Prize, Meccano or Hornby products value £3/3/–: M. Donner, Neuchatel, Switzerland. 2nd, products value £2/2/–: T. and A. Ahmed, Shillong, Assam, India (joint award). 3rd, products value £1/1/–: A. N. Damania, Bombay.

Products value 5/–: P. Gilles, Montpellier, France; R. Munro, Otorohanga, N. Zealand; H. Dorgelo, The Hague; L. Linder, Stockholm; C. Fishburn, Edmonton, Canada.



A fine Meccano traction engine in which skilfully constructed detail work is incorporated. The model was built by C. H. Pendlebury, Hinckley, who was awarded First Prize in the Home Section of the "Winter" Model-Building Competition.

One of the best built and most fully detailed models entered in recent contests is the fine traction engine illustrated on this page. It was constructed by C. H. Pendlebury, Hinckley, who was awarded the First Prize in the Home Section. The model is driven from a reversing Electric Motor through a two-speed gear-box, and the rear wheels are fitted with external contracting brakes controlled from a handwheel on the driving platform. A second handwheel is used for steering. The front axle is mounted under the boiler by means of a Ball Bearing. One of the many pleasing features of the model is a neat dynamo built up from Boiler Ends. The valve gear, steam chest fittings, and the huge rear road wheels are skilfully constructed, and closely resemble those of an actual tractor of this kind.

D. M. Davies, Maesteg, who won Second Prize in the Home Section, submitted an interesting and unusual model of an automatic spoil tipper, similar to those used in coal mining districts for dumping waste material or spoil brought from the pits. The trams or tubs containing the waste are run one by one on to a platform fixed on a cylindrical cage or tumbler, which is mounted on a wheeled carriage that travels on an inclined runway. The tumbler is free to revolve, but normally it is maintained in a horizontal position. The carriage is hauled up the runway, and when it reaches the top it makes contact with two ramps that cause the tumbler to revolve, thus discharging the contents of the tub.

Angle Girders are used extensively in the construction of the rails and runway of the model, and the tumbler is built up of four Circular Girders and Strips. A counterbalance for the carriage runs on the underside of the runway. The model is electrically lighted, and a red lamp, which is illuminated automatically as the cage nears the top of the runway, is placed near the controls. Davies is to be congratulated on the neat and solid appearance of his work.

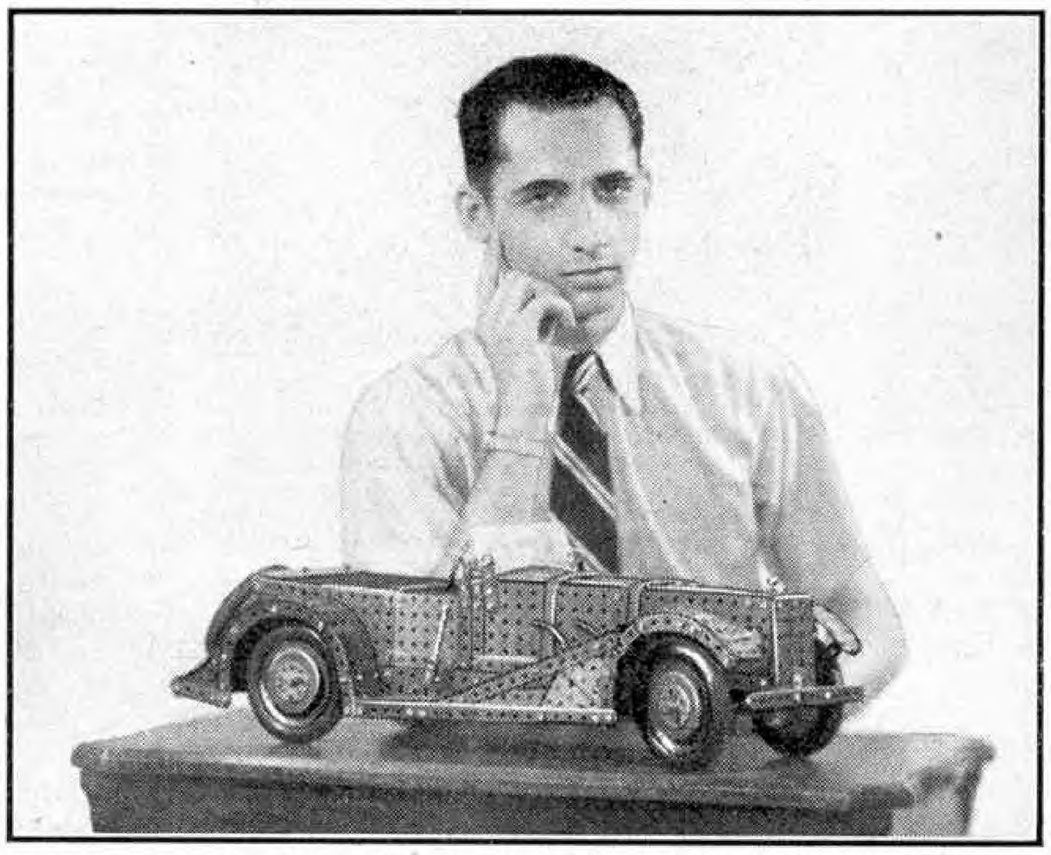
Third Prize in the Home Section was awarded to A. Foster, Bacup, for a neat model of a twin-cylinder steam mill engine. The model is driven by a Clockwork Motor, which is mounted outside the base. In this position it rather spoils the appearance of the engine, and it would have been much better concealed inside the base. Apart from this the model generally is not of quite the same standard as the two already described, but it is nevertheless a very fine effort.

Among the other prize-winning models in the Home Section is one of the "Schools" Class locomotive *"Harrow,"* built by S. F. Aiken, Putney, whose effort is deserving of high praise, since this is the first time he has entered for an *"M.M."* model-building competition.

H. Lee, Ardrossan, sent a model motor cruising yacht. This is undoubtedly a very fine piece of work. The constructional details especially are excellent, and display several novel uses for the parts incorporated.

The best model in the Overseas Section was received from Max Donner, Neuchatel, Switzerland. It is a mechanical excavator on creeper tracks, and is one of the best models of its type that I have seen for some time. It is well proportioned, and a mass of concentrated mechanism is revealed when part of the cab is removed. Two Motors operate the various motions. One of them is concerned entirely with driving the creeper tracks, which are constructed from 1½" Strips fastened with paper clips to Sprocket Chain. The other Motor is mounted on the superstructure, and operates the digging, luffing and slewing motions through a gear-box.

A joint entry from T. and A. Ahmed, Shillong, Assam, India, succeeded in winning the Second Prize in this Section. Their model is a miniature of a machine designed for levelling and cambering the surface of roads.



A. N. Damania, Bombay, and the model motor car with which he won Third Prize in the Overseas Section of the "Winter" Model-Building Competition.

The lower illustration on this page shows a neat four-seater sports car constructed by A. N. Damania, India, who was awarded Third Prize for it. A good idea of the size of the model can be gathered from comparison with the figure of the builder.

The body of the car consists of Flat Plates and Strips cleverly arranged to give a smart streamlined appearance. Exhaust pipes issuing from the sides of the bonnet are represented by Springs, and two spare wheels are mounted at the rear of the body. The "engine" is a 6-volt Electric Motor.

Results of the "New Year" Model-Building Competition (Overseas Section)

The principal prizes in the Overseas Section of the "New Year" Model-Building Competition were awarded as follows:

1st Prize, Meccano or Hornby products value £3/3/–: A. Butcher, Christchurch, New Zealand. 2nd, products value £2/2/–: H. Degenhardf, Amsterdam. 3rd, products value £1/1/–: C. Teixeira Gomes, Portugal.

Products value 10/6: D. Weily, Orange, Australia; J. den Boer, Vlaardingen, Holland; F. Schorrewegen, Lierre, Belgium; H. Foden, New Westminster, B.C., Canada; V. di Sambuy, Torino, Italy.

Products value 5/–: C. Turner, Johannesburg; D. Hofsommer, The Hague, Holland; H. Lanz, Murgenthal, Switzerland; R. Rivier, Rome.



Thoughts on Coming Events

August is by no means a dead time in club work, although outdoor meetings and pleasure excursions may preponderate, or meetings may even be suspended altogether because of the absence on holiday of members. It offers splendid opportunities for thinking over the days to come and the programme that has to be arranged in order to stimulate the interest and enthusiasm of members.

Exhibitions, Concerts and Socials will figure prominently in the plans that Leaders are now outlining for the winter nights, but an attractive programme also is needed for the daily round of club life, if satisfactory progress is to be made. The central feature must be model-building, the foundation of all Meccano clubs. The old favourites of course must be represented, for members never grow tired of building ingenious models for Exhibitions, or club competitions, showing their skill in the design of "Simplicity" and other special types, or joining in Contractor's Evenings or similar events that have a sporting flavour.

A New Outlook for 1938-9

All these are good, but I want to suggest adding a new outlook for the coming winter sessions by the making of efforts to win some of the splendid prizes offered in the monthly contests announced in the *"M.M.,"* the official organ of the club movement. Model-building Contests within a club give no satisfactory means of comparing the skill and industry of members with those of other Meccano enthusiasts. The *"M.M."* contests supply this lack, and the greater rivalry they bring with them will help to increase the fun of club model-building.

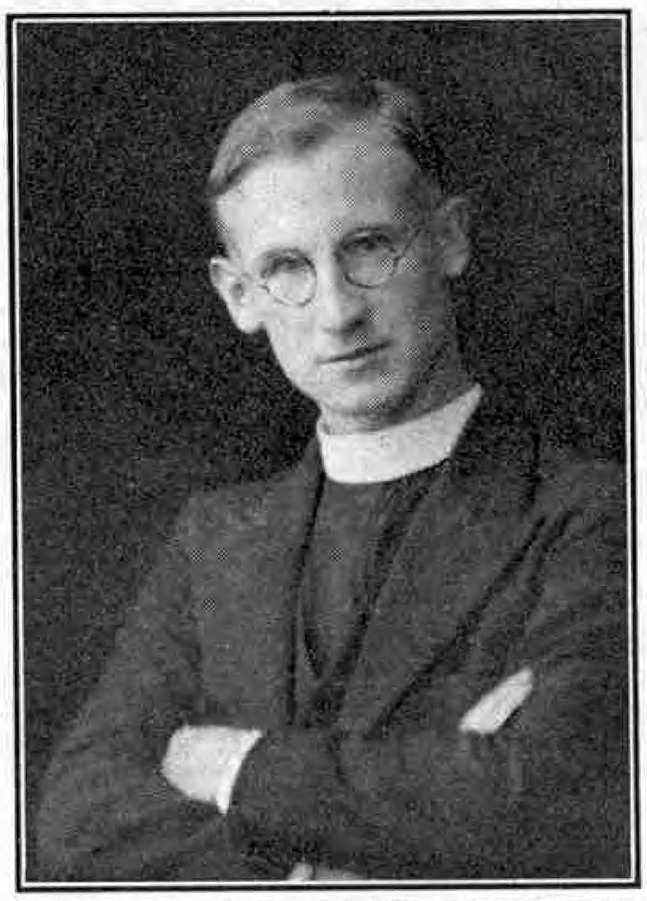
There are several ways in which club members can enter into *"M.M."* contests. One is for individual members to make up their minds that they will do their best to give their own clubs a really good show. Another, and perhaps the better way, is for models built in connection with club proceedings to be submitted in suitable competitions after receiving the approval of the Leader generally, so that they can be regarded as representative of the best model-building ability of the club. The preparation of entries should not be difficult, for clubs that have no photographic section usually include a few amateur photographers who would be glad to supply prints.

The officials and members of several clubs, both at home and overseas, have already realised how valuable keen efforts to win success in *"M.M."* contests are in developing club spirit. I should like every Leader to follow their example, and to submit as many entries from their members as possible during the coming winter sessions, which will be marked by a series of splendid competitions giving wide scope for the display of model-building skill.

Special care should be taken to mark every entry of this kind with the name of the club as well as that of the member concerned, and it should be made clear at the start that members who win prizes will have their names included in the Honours Lists of their club, and may be recommended for the award of Merit Medallions.

Meccano Club Leaders

No. 94. Rev. Bro. Stephen



The Rev. Bro. Stephen is Leader of The Beeches M.C., De La Salle College, Jersey. The club was affiliated in December 1936, and members have shown themselves very active and versatile. An excellent club magazine is issued. Successful Exhibitions have been held, and a novel feature of the most recent was a Recruiting and Information Bureau, the staff of which were kept very busy.

Juniors in Club Life

A point that Leaders should keep in mind when making plans is the position of junior members. It may be a little difficult to arrange a programme that will suit members of all ages, but I do not think that this is sufficient reason for excluding younger boys, nor is this advisable, even if some of the older members of long standing feel a little aggrieved when asked to associate with boys several years younger than themselves.

The difficulty can best be overcome by organising separate Senior and Junior Sections, but when this cannot be done it is well worth while enduring a little discomfort in order to encourage younger boys. It is they who will keep the club running in the years to come, and indeed a club without juniors almost certainly is one heading for a speedy end. Every effort therefore should be made to recruit youthful enthusiasts and to give them a good time when they have become members.

The ideal of course is for seniors to encourage their juniors and to help them on every possible occasion. It is a fine thing when boys realise this, and I am sure that any little trouble that may occur can be smoothed out when this is pointed out by the Leader. The true relations between senior and junior members is that indicated by the names "Engineers" and "Apprentices" that distinguish the sections of the Hornsea M.C. This club has had a long and creditable history and to-day is strong and progressive, a result due largely to the policy of encouraging junior members that is laid down by the Leader and carried into practice with the help of the older members.

Merit Medallions

I wish to remind Leaders that in each club two Merit Medallions may be awarded for good work during the summer session. There is no restriction as to the kind of activity for which this award is made, and its continuance during the outdoor season allows a variety of good service to be recognised. Leaders therefore should keep an eye on the proceedings of members during excursions and special visits, as well as in meetings held in the club room, so as to recognise efforts to add to the fun and value of club life generally. Nominations should reach me as early as possible in September.

Proposed Clubs

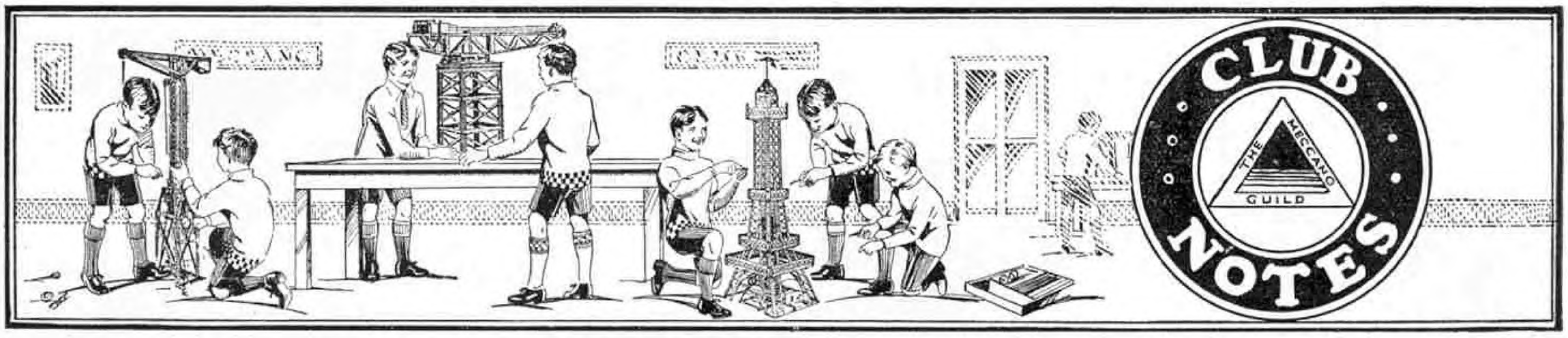
Attempts are being made to establish Meccano Clubs in the following places, and boys interested should communicate with the promoters, whose names and addresses are given below:

AUSTRALIA—R. N. Tuxworth, 187, Mitchell Street, North Ward Townsville, Queensland, Australia.

AUSTRALIA—Mr. P. P. Gorman, 13, Otira Road, Caulfield, S.E.7, Melbourne, Australia.

CANADA—H. Morgan, Lucan, Ontario, Canada.

CARDIFF—R. Harris, 129, Mackintosh Place, Roath Park, Cardiff.



Sutton Valence Council School M.C.—Members are building a giant model skyscraper that will incorporate many of the features of actual buildings. Motor cars and aeroplanes have been subjects for Model-building Evenings, and a variety of interesting models have been constructed. The programme also has included a Treasure Hunt, walking and cycling tests, and a Spelling Bee in which members were narrowly beaten by a team representing the rest of the school. Special competitions were arranged during a recent school holiday, and points awarded in these completed the totals in the competition for the Club Trophy awarded half-annually. Club roll: 19. *Secretary:* C. Austin, East Sutton Park Lodge, Sutton Valence, Kent.

St. Stephens (Saltash) M.C.—Good progress has been made by the Meccano Section. A fine model of Tower Bridge was the best of recent efforts, and models of the new Union-Castle liner "*Capetown Castle*," a cattle dock, and a difficult curved tunnel are now being made. The club recently celebrated its third birthday with a party. Members took part in the Whitsuntide Rally of South Devon Meccano Clubs at Plymouth. Games have been played, and Mr. Ellis, Leader of the Plymouth M.C., has been a welcome visitor. Club roll: 6. *Secretary:* B. Braund, 9, Homer Park, Saltash.

Barnard Castle School M.C.—In addition to model-building Dinky Toys activities have played a great part at recent meetings, and a Dinky Toys Section is to be formed. Transport working in connection with a "quarry" has been reproduced with miniature vehicles, and driving tests have been held on a special road layout. Club roll: 10. *Secretary:* K. R. Southern, Barnard Castle School, Barnard Castle.

Coloured Mission (Cardiff) M.C.—Model-building has been maintained at its usual high standard, a number of fine models having been constructed. It is hoped to hold a model-building contest in the near future. Club roll: 15. *Secretary:* D. H. Binstead, 37, Penhill Road, Cardiff.

Stretford Public Libraries M.C.—Among the many interesting and well constructed models brought to meetings for demonstrations were a neat and sturdy racing car, a realistic roundabout, and an excellent lorry incorporating special features that allowed it to be driven easily by a *Magic* Motor. Stamp activities continue to be followed with interest. Club roll: 35. *Secretary:* Miss F. Scattergood, Public Library, Technical Institute, Stretford Road, Old Trafford, Manchester 16.

The Beeches (Jersey) M.C.—Recent meetings have taken the form of rambles or excursions for photographic purposes. Prizes have been offered for the best photographs taken by members. An interesting visit has been paid to an extensive miniature railway layout owned by Dr. Labesse. Arrangements are being made for an Exhibition, and negotiations are afoot to obtain a new clubroom. Club roll: 28. *Secretary:* D. Nicholle, La Colomberie, 36, Colomberie, St. Helier, Jersey, Channel Islands.

Winchmore Hill Collegiate School M.C.—The Hornby Section of the club have rebuilt the baseboard of the club layout, and plans are being drawn up for the re-laying of the track. An enjoyable visit has been paid to the Kingston-on-Thames works of Leyland Motors Ltd., whose members were particularly interested in the presses and soldering appliances. Several new members recently have been enrolled. Club roll: 31. *Secretary:* F. J. Hearn, 143, Conway Road, Southgate, London N.14.

Wednesbury M.C.—Model-building is being carried on with enthusiasm, and work on the club's Hornby Train layout is progressing. The Woodwork Section is very active, and has a large number of orders to deal with. Social events have included a Concert, a Darts Tournament between teams representing members and the President and Vice-Presidents respectively, and a General Competition Evening. Arrangements for the future include a visit to Birmingham Telephone Exchange and a Table Tennis Handicap Tournament. Club roll: 25. *Secretary:* M. L. Done, 31, Waverley Road, Darlaston, Wednesbury, Staffordshire.

Folkestone M.C.—Interest has been centred on the construction of a model schooner 2 ft. in length, and named "*Queen of the South.*" Special care has been taken in the construction of all parts, and a great amount of detail is incorporated. The model completed successful trials on a local park lake. Other model boats are to be constructed during the summer. Club roll: 7. *Secretary:* W. F. Cotter, 52, Hill Road, Folkestone.

Old Charlton M.C.—Many interesting models have been built and a number of new constructional ideas developed. A Lecture has been given by a local councillor on the procedure at Council Meetings, and a Talk also has been given on "*Telephones.*" A game of "*Beetle*" was much enjoyed. Coming attractions include a Spelling Bee and the construction of "simplicity" models. Club roll: 33. *Secretary:* F. J. Ambrose, 72a, Charlton Road, Blackheath, London S.E.3.



A group of members of the 28th Edinburgh M.C. Mr. McCall Barbour, President, is in the centre of the front row, and Mr. W. Brotherstone, Leader, is seated on the extreme left. Affiliation was granted in March 1930, and the club has enjoyed a long and successful career. Under Mr. Brotherstone's experienced Leadership keen interest is taken in Model-building, and social events also are greatly enjoyed.

Mall School M.C.—An interesting summer programme is being followed. One evening was employed in the testing of members' Hornby locomotives, each being timed for a run along a track some 25 ft. in length. A General Knowledge Test has been held. Club roll: 32. *Secretary:* A. C. James, 45, Popes Grove, Twickenham, Middlesex.

Breich M.C.—Outstanding models built recently include a factory, in which members displayed unusual interest, and a tractor that has extraordinary pulling power. An enjoyable party was held on the completion of the club's second year of affiliation to the Guild. Plans have been made for rambles and excursions. Club roll: 11. *Secretary:* M. Anderson, 36, Breich Terrace, West Calder, Midlothian.

Exeter M.C.—An unusually large number of fine models have been constructed recently by the enthusiastic members of this club, outstanding being a model yacht and a "super-model," 5 ft. 3 in. in length, of Exeter Museum. The chief feature of the programme has been the Rally at Plymouth. A large party from Exeter greatly enjoyed this event, at which four Meccano clubs were represented, with an athletic and sports club, the presence of members of this being a result of the "Keep Fit" activities of the Meccano clubs concerned. Club roll: 40. *Secretary:* J. T. H. Fenwick, 45, Calthorpe Road, Exeter.

Hornsea M.C.—An interesting talk and demonstration on the camera and the development of films aroused great interest. A Hornby Railway Evening was well attended, and attractive train running carried out. The Leader gave a special talk on a visit he had paid to London. A cinematograph show was greatly enjoyed. Club roll: 16. *Secretary:* P. Richardson, "Summerleigh," Esplanade North, Hornsea.

Islandmagee M.C.—A new clubroom has been secured, and members have "moved in." Model-building continues to be carried out with great enthusiasm. Outings have included Rambles to Brown's Bay, where games were played on the shore, and energetic indoor programmes have provided outlets for members' enthusiasm in bad weather. The President presented Merit Medallions and various prizes won by members at a special meeting at which the local press was represented. A summer camp has been arranged. Club roll: 17. *Secretary:* S. McCready, Hillmount, Islandmagee, Co. Antrim.

Sid Vale M.C.—A party of members travelled to Plymouth to take part in the Rally of South Devon Meccano clubs. A visit to the Devonport Dockyard had been arranged, and members found this extremely interesting; the ensuing meeting at the headquarters of the Plymouth M.C. also was greatly enjoyed. There has been a pleasant ramble to Honiton Common. Club roll: 20. *Secretary:* L. R. Gliddon, Sheffield House, Sidmouth.

St. Oswalds M.C.—Model-building has continued, but outdoor activities and games have occupied a large part of the programme. Two weekend camps have been held, and these were voted great fun by all who attended. A treasure hunt in which the hidden wealth was a Hornby Railway Company badge proved very exciting. Future arrangements include games of Rounders and a Discussion on Holidays. The club programme is to be made the subject of criticism, and possible improvements will be considered. At present meetings are being held at the Leader's home. Club roll: 25. *Secretary:* J. F. Jaques, "Elmolino," 5, Ingram Road, Thornton Heath, Surrey.

AUSTRALIA

Maylands M.C.—A considerable increase in membership has necessitated the re-arrangement of club meetings. Members now have the fullest possible use of the stock of Meccano parts for model-building, and those in the harmonica band can practise without interfering with other club pursuits. A silver cup presented for good work in connection with the band went to R. Le Cheminant. A paperchase has been held, and although the hares got home well ahead of the pack, the event was so much enjoyed that another is to be arranged. Books can now be borrowed from the Library free. A cycle excursion to the nearby National Park was enjoyed by all. Club roll: 34. *Secretary:* R. Le Cheminant, 60, Crawford Road, Maylands, Western Australia.

NEW ZEALAND

Christchurch M.C.—Final conditions have been drawn up for the competition for the Christchurch-Ashburton Inter-Club Shield, every six months to be awarded for model-building, attendance and recruiting. Subjects have been settled for this year's models, and members have commenced work on them. The Annual Social of the club, attended by many members of the Ashburton Club, was a great success, and games were played with the usual vigour. Club roll: 37. *Secretary:* S. S. Stringer, 250, Oxford Terrace, Christchurch, C.1, New Zealand.

SOUTH AFRICA

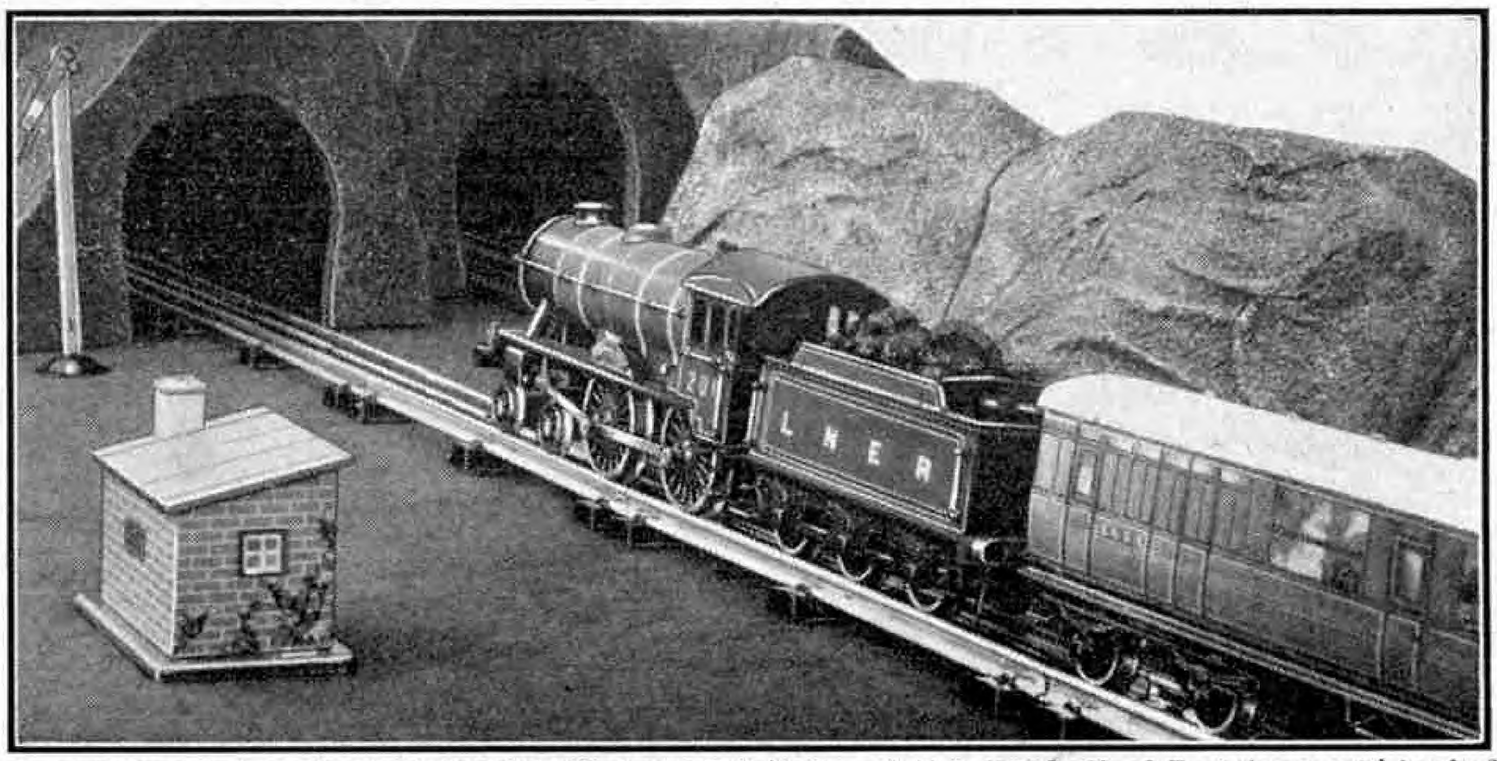
Southern M.C.—Excellent progress has been made in Model-building, models being confined to engineering subjects. A full-size lathe is at present under construction. Members visited and inspected the Capetown Fire Station, and were so interested in it that the Fretwork Section are now making a model of the building. A party of members saw the rugby match at Capetown between South Africa and the British Touring Team. Club roll: 17. *Secretary:* R. H. Moodley, 10, Stirling Street, Capetown.

Cuttings and Tunnels on Hornby Railways

Useful Additions to Lineside Scenery

NO miniature railway can be regarded as complete or realistic unless it reproduces in some form the cuttings and tunnels that make real railways interesting. On miniature railways, particularly those that have to be taken up frequently, the inclusion of cuttings formerly was a matter of some difficulty. This trouble was overcome by the introduction of the Hornby Cuttings, and now the most temporary of layouts can have such features. The longer Cuttings are designed in sections of such a shape that cuttings of any suitable length can readily be built up.

The smallest and simplest of these valuable Hornby Accessories is the No. O Cutting, which consists of two sloping "banks" mounted on a base over which the railway track is laid. The base is square, with a side 6 in. long, and over it trains run between banks rising from the lineside in exactly the same manner as those of real cuttings. The banks are made of fabric shaped in a realistic manner and finished in natural colours. This Cutting is particularly suitable for Hornby railways with single track.



A miniature L.N.E.R. express about to plunge into a Hornby Tunnel. Two Hornby No. 2 Tunnels are used to give the effect of twin bores, and they are led up to effectively by Hornby No. 2 Cuttings.

There are three sections of the larger Cuttings, known respectively as the No. 1, No. 2 and No. 3 Cuttings, and each is a section designed with a special purpose in view. The No. 1 Cutting is an End Section, reproducing the increasing height that is noticed by every traveller when entering a real cutting. The No. 2 Cutting is a Straight Centre Section, the height of which is approximately the same throughout and is equal to the greatest height reached by the End Section. One bank of a very effective Cutting therefore can be made by placing a No. 2 Cutting between two No. 1 Cuttings, and by repeating this operation on the opposite side of the track a very fine miniature cutting is obtained. The Centre Section has a length of $10\frac{1}{4}$ in. and the End Section of $7\frac{3}{4}$ in., so that the total length of a cutting built up in this manner is $25\frac{3}{4}$ in.

The No. 3 Cutting is similar to the No. 2 Cutting, except that it is curved. The use of curved cuttings on a miniature line adds greatly to the fun of operations, as well as giving variety to the general appearance, and a very fine curved cutting that is suitable for both 1 ft. and 2 ft. radius track is readily made by combining the No. 3 Cuttings with End Sections in the manner already explained when dealing with Straight Cuttings.

Various other combinations will no doubt suggest themselves to Hornby Train owners. For instance, a short cutting can be made by combining two End Sections on each side of the track. Another plan for exceptional circumstances is to have a straight bank along one side of the line and a bank curving outward on the other. This would enable a junction to be made in the cutting. Junctions of this kind are perhaps not often seen on real railways, but have been made in special cases.

Yet another scheme is to use Hornby Cuttings to lead up to the entrance of a Hornby Tunnel. This is a very effective plan, for on real railways trains do not run suddenly from level ground into tunnel mouths, but reach them by passing between banks that become higher and higher until the limit is reached. The Hornby Tunnels are made of the same material as the Cuttings, so that the two can be used together with a very natural and realistic effect.

There are few thrills greater than to see a miniature train plunge into a tunnel. There are five Tunnels in the Hornby System, and the fun of having these structures on a miniature railway can be enjoyed by every owner, no matter how small his layout may be. The No. O, No. 1 and No. 2 Tunnels are straight. For very small layouts the No. O Tunnel is excellent, and of course it can also be used on large layouts to represent short tunnels. This Tunnel is straight, and is 6 in. long.

The No. 1 Tunnel is larger, its length being $7\frac{3}{4}$ in., while its overall width at the base is $6\frac{1}{4}$ in. The No. 2 Tunnel has a length of $15\frac{3}{4}$ in., or a little more than twice that of the No. 1 Tunnel. It also is wider, the extra material that is put in to give a base measurement of $9\frac{1}{2}$ in. being planned to give a more natural appearance than the smallest tunnels can have. This is the largest of the straight Tunnels, but if a longer tunnel is required it is a simple matter to combine tunnels, and when No. 1 Cuttings are used to form the approaches, a really imposing structure can be laid down on a miniature railway.

The No. 3 and No. 4 Tunnels are curved, with lengths of 13 in. and 20 in. respectively. The No. 3 Tunnel can be used on track of 1 ft. or 2 ft. radius, but the No. 4 Tunnel is suitable only for track of 2 ft. radius. The shape of these Tunnels allows them to be used with advantage in corners of a layout, where at times it is difficult to devise lineside scenery that is suitable and really effective.

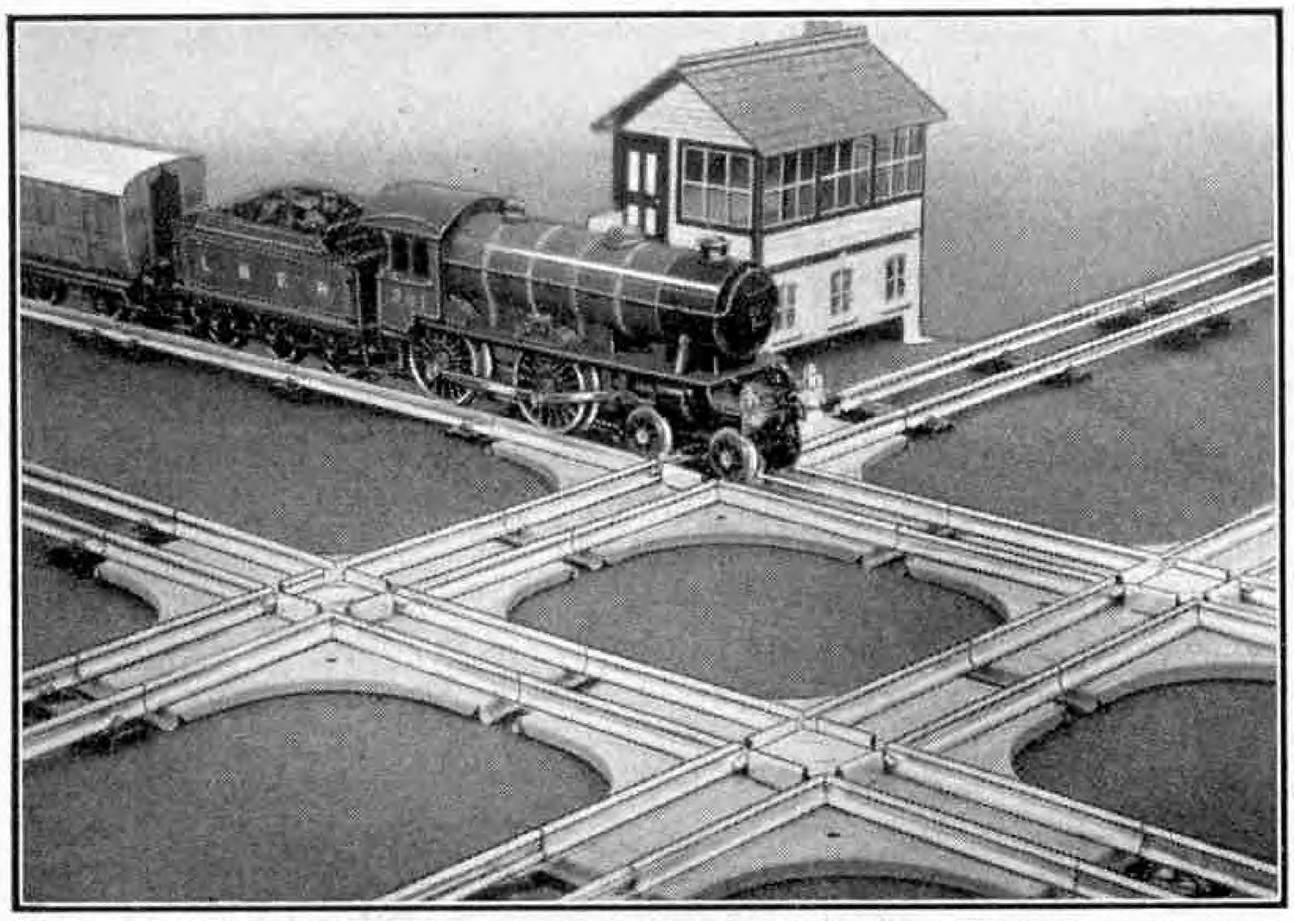
A point that should be kept in mind is that Hornby Tunnels are arranged to accommodate only a single track. When a double track main line is required to pass through a tunnel two separate bores therefore must be provided as shown in the illustration on this page. This is quite in accordance with railway practice.

How to Use Hornby Crossings

An Interesting Type of Layout

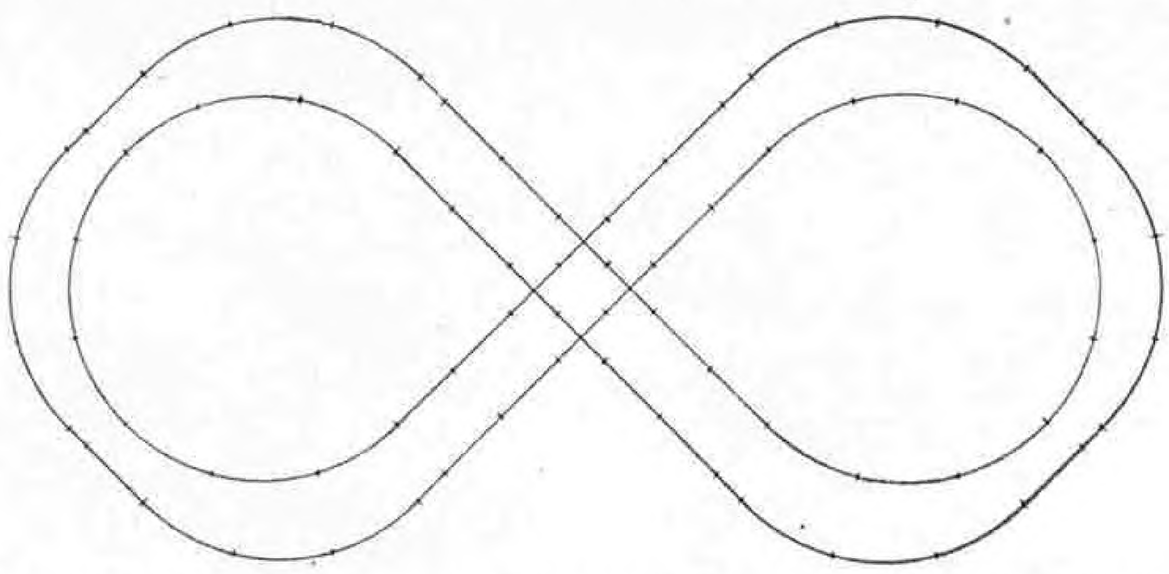
AMONG the most interesting and popular tinplate track components in the Hornby Series are the Acute-angle and Right-angle Crossings. Probably few layouts have been developed to a more or less complete state without incorporating one or other of these Crossings. As their name implies, they allow one track to cross another on the level, but give no choice of routes, as do points. The Crossings have in fact no movable components, but their use makes possible some interesting developments in track layouts.

The simplest form of miniature railway layout is the plain circle, and it is usual in the earliest steps of the development of a system to extend the circle into an oval by the addition of straight rails. This of course is satisfactory, and splendid systems can be built up from the oval by the addition of points. The oval track by itself allows of no greater running possibilities than does the plain circle, however, and Hornby train owners on the lookout for further variety in their operations invariably turn their attention to the type of layout that is popularly known among model railway enthusiasts as the "figure 8."



A Hornby L.N.E.R. express running over the double crossing that forms the basis of the layout described on this page. The realistic effect that is obtained is quite striking.

The shape of this type of layout will be obvious from the name, and its essential feature is a Hornby Acute-angle or Right-angle Crossing at the centre. In addition to being available in these two patterns, Hornby Crossings for clockwork layouts are made with arms of suitable length for use in conjunction with 2 ft. radius and 1 ft. radius curves respectively. For electric tinplate layouts only one type of Crossing is available, for use in conjunction with 2 ft. radius curves, and this is made in two patterns having acute and right angles respectively. There is no disadvantage in this, however, as the difference in the length of the arms of the 2 ft. radius and 1 ft. radius patterns can be made up by adding a standard Straight Quarter Rail to each arm of the Crossing.



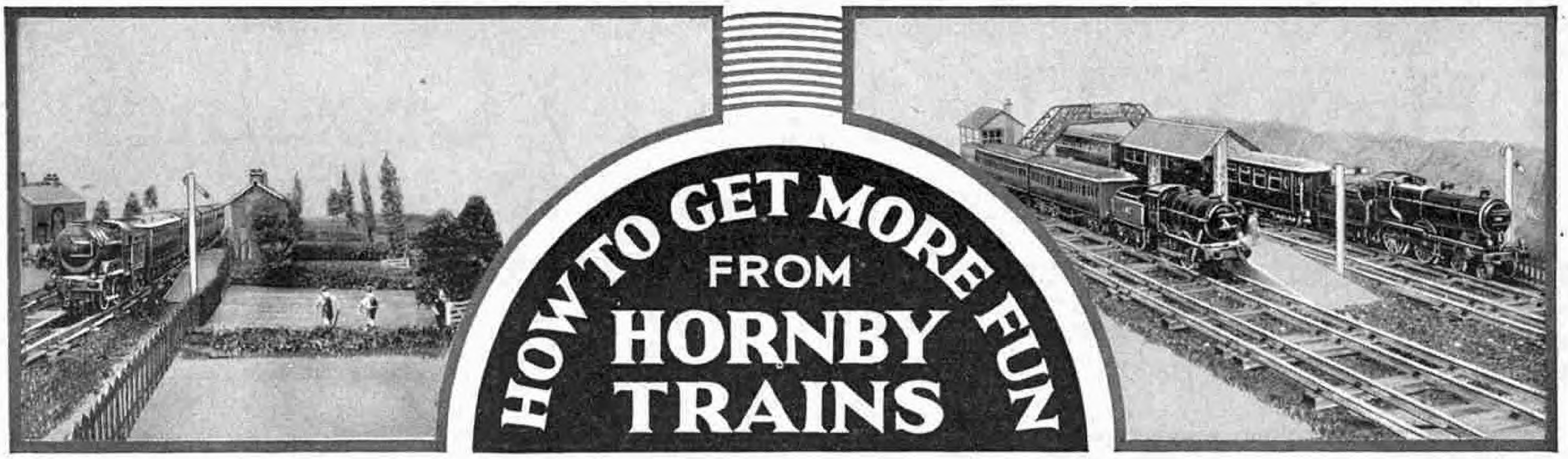
Above is a diagram of the layout dealt with in this article. The rails required to complete it are: 36 A2, 20 B1, 4 B½, 4 B¼ and 4 CR2.

A fine variety of layouts can be made up with Hornby Crossings, and many of these will be found in the booklet *"Hornby Layouts,"* a copy of which should be obtained by all owners of Hornby Tinplate Track. It can be obtained from all dealers price 3d., or it will be sent direct from Meccano Ltd., for 4½d., post free.

As a general rule layouts incorporating Hornby Crossings are of the single track kind. It is easy to construct double line systems incorporating Crossings, however, and an interesting example is shown in the diagram on this page. A necessary feature is the inclusion of four Right-angle Crossings, which are connected to each other to form a double level crossing.

An interesting point about the layout is that both tracks are of exactly the same overall length. A train on the inner line of one section of the layout automatically runs on to the outer line of the other after negotiating the crossings. This means that the layout is invaluable as a test track, as locomotives can be tested against each other both for speed, haulage and length of run. It is fascinating to note the performances of two locomotives on the layout at once, each on a separate track. Care must be exercised in operation in order to avoid any collisions at the crossings, but this can usually be effected easily by starting them side by side on the crossing itself.

The upper illustration shows the four Crossings on their solid bases, which make a neat and effective assembly in the centre of the layout. With the Hornby L.N.E.R. No. 2 Special Locomotive *"The Bramham Moor"* negotiating the crossing one is reminded strongly of the complicated crossing layout on the L.N.E.R. outside Newcastle Central Station. The crossing on the level of main line is rare in this country, although the route of *"The Flying Scotsman"* is crossed on the level twice between London and York. One of these crossings is at Newark and the other is situated at Retford.



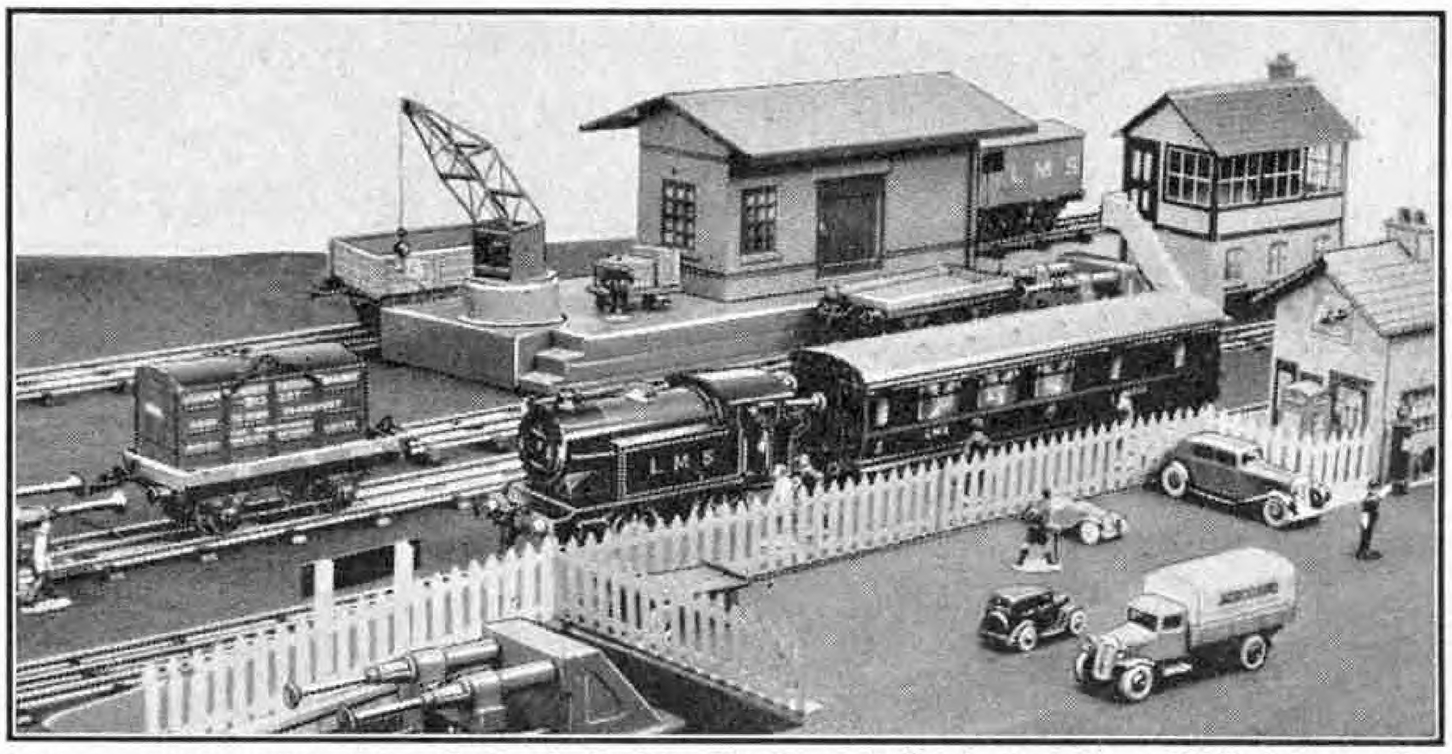
THE WORKING OF SUBURBAN SERVICES

THE greatest delight of most model railway engineers is to operate long-distance expresses that reproduce on a small scale the features of such famous trains as the real "*Royal Scot*" or "*Flying Scotsman*." They may have to forego the running of these trains, however, as many factors may make such operations impossible. One of the chief of these factors is the matter of space. The amount of space that is available for a layout has far more influence on the final arrangement and working of the miniature system than is apparent at first. Space not only governs the actual extent of the line, but also affects the radius of the curves on it, and this in turn governs the choice of the rolling stock. In a limited space small radius curves therefore may be necessary, and in these circumstances only the smaller locomotives and items of rolling stock can be operated with any success.

For these reasons it is not always the best policy to attempt the running of "crack" expresses, and the operator then will have to be content with the operation of less ambitious services. He need not be downhearted over this, however, for he can enjoy just as much fun in the correct reproduction of the less spectacular train services of actual practice. He then has a choice between the working of goods trains and the operation of local or suburban passenger services, and in actual fact the two may be combined.

Goods train working is very fascinating, as the articles on this topic that have appeared in the "*M.M.*" show. There is variety and interest in planning the layout of goods yards and stations, in making up the trains and in providing suitable loads for the wagons employed, according to the district supposed to be served by the line. The running of ordinary passenger trains is no less attractive, and the trains themselves are important, for they are as useful to the people who travel by them as to the companies who run them for the revenue they produce. We propose therefore to devote this article to them, and particularly to suburban trains. These may appear too familiar to many Hornby Train owners, possibly by reason of daily travel in them, but they offer many interesting possibilities for miniature railway working.

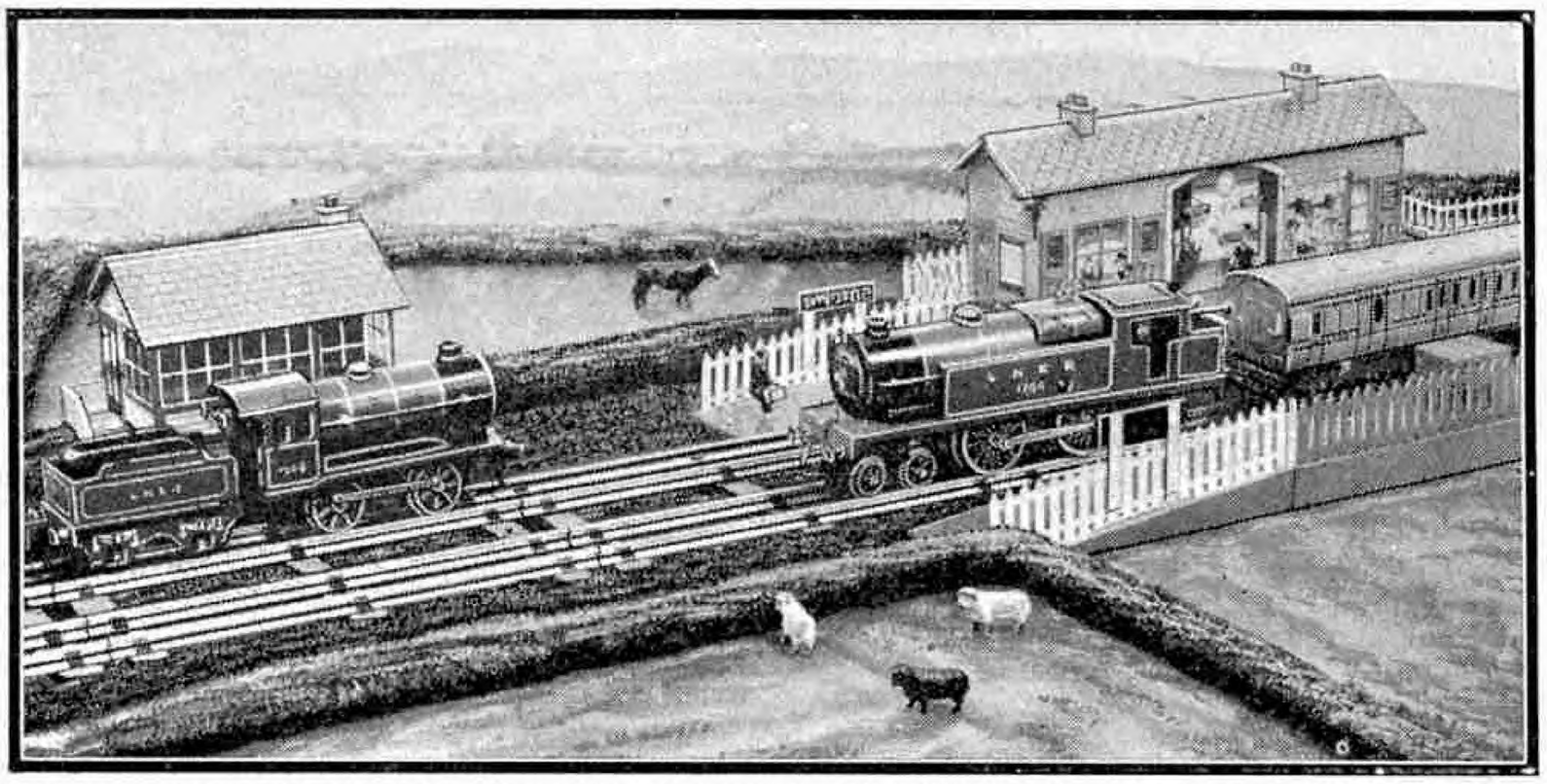
First of all let us consider the necessary layouts, which depend on the type of trains to be run. The equipment may be simple, provided that there is sufficient accommodation at the main station, especially where this is of the terminal pattern, such as in a non-continuous layout. Facilities for allowing the engine to run round its train should be available if possible. Where space is limited there may not be room for the necessary points or cross-overs, however, and in that case a fresh locomotive can be employed for the return journey. The name "turnover" locomotive is applied to the engine that takes up the duty in this manner. No turntable will be necessary if tank engines are employed, for these can be run equally well backward or forward, as is done in practice. Wayside stations and other features may be of simple character, according to the extent of the system and the resources of the "company."



A useful rail motor unit consisting of a Hornby No. 2 Corridor Composite Coach attached to an M3 Tank Locomotive is shown alongside the platform in this illustration.

A variety of rolling stock is available for these services. The trains may be made up of Hornby No. 1 Passenger Coaches, and as they have to run in both directions, with little or no re-marshalling, a passenger Guard's Van should be placed at each end. An interesting scheme is to form the coaches into set trains for the various services, and for convenience in arranging working timetables, and for reference generally, each train should be given a letter or a number, or even a name. The coaches may be arranged in close-coupled sets of two or three. Such sets are very useful for intensive suburban services, for they are operated as complete units and require no making-up in the sidings, once the permanent coupling has been arranged. Extra vehicles can be added during particularly busy periods, or possibly two sets can be combined to form one train. Units of two or three coaches can then be kept in reserve for such duties, and should be labelled "strengthening sets," after the custom of real practice.

For such trains as these a suitable type of locomotive is the Hornby M3 Tank. These little engines are simple in external design, as are most small tank engines engaged in suburban work, and like them they have remarkable power for their size and a very good length of run. At first glance the latter quality may not appear of much moment for short-distance stopping trains. Actually it is of great importance, however, for it allows the operator to run an engine for a complete trip, including several stops, without having to rewind the motor. Reversing gear of course is provided, as is necessary on a tank engine that is required to work equally well forward and backward.



A typical scene on a suburban line. A heavy stopping passenger train hauled by a No. 2 Special Tank Locomotive is about to pass a goods train proceeding in the opposite direction.

The Hornby No. 1 Special and No. 1 Tank Locomotives are more elaborate in general style. Both engines have outside cylinders and thus may be used to represent many of the tank engines of more up-to-date design, but still of moderate dimensions, that are now run on intensive suburban services. A useful feature is that the reversing gear can be operated from the track as well as by means of the lever in the cab. This allows the engine to be manœuvred in a satisfactory manner by means of Brake and Reverse Rails placed in suitable positions along the track, such as in stations and sidings.

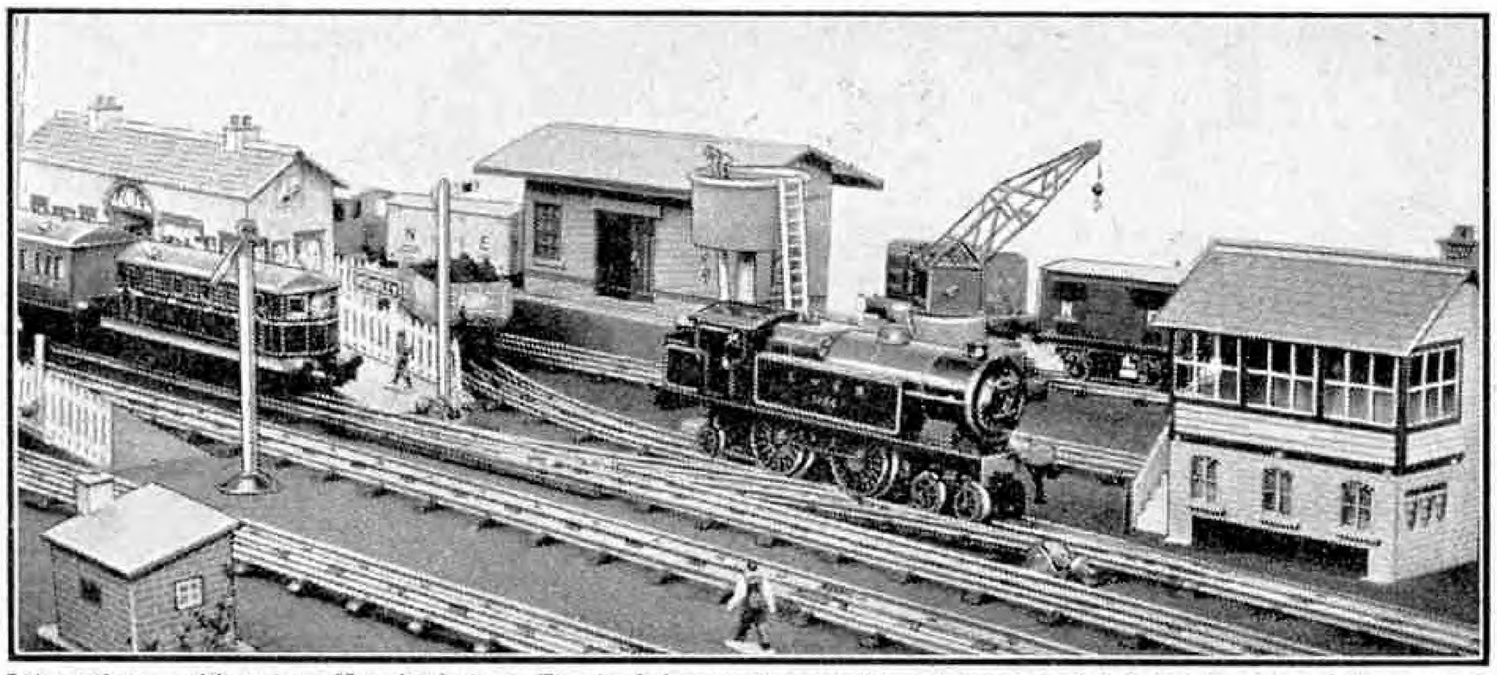
The services operated by such trains can be supplemented, or even replaced during periods when little traffic is to be handled, by a motor train consisting of only one coach, which in one direction is pulled by the engine, and in the other is pushed. Useful employment is found in this manner for a small tank engine that may be of an obsolete pattern, and perhaps is now of insufficient power to take its place in a "link" with more up-to-date engines on suburban duties.

A rail motor also is very useful for maintaining connecting services on branch lines. The station equipment of a branch may be of the simplest character, and then there is a considerable advantage in the use of a motor train or a rail motor, for neither requires running-round facilities at terminal points. The simple nature of branch stations suggests a further possibility that we may make use of on the main line itself. This is to provide a platform or "halt" between two recognised main stations. Such halts are often found in actual practice, and are frequently provided in districts that are developing between existing stations. They enable the railways to offer a service for passenger, and perhaps light goods traffic, that otherwise might go by road.

Not all trains may be booked to call at a halt, and the omission of stops at main stations by different trains will be quite in order, as this frequently is a feature of actual suburban services. Rail motors should call at small stopping places, for which they afford a useful service.

More elaborate provision must be made for longer distance traffic, on which trains run very smartly between stations and on some sections can be regarded as expresses. Bogie coaches are the rule and powerful tank engines are used on these trains. On a Hornby railway therefore the splendid No. 2 Passenger Coaches are ideal for such work. They may be arranged in sets if desired, with a Composite coach at each end of the train, and a train made up in this manner has an interesting and distinctive appearance.

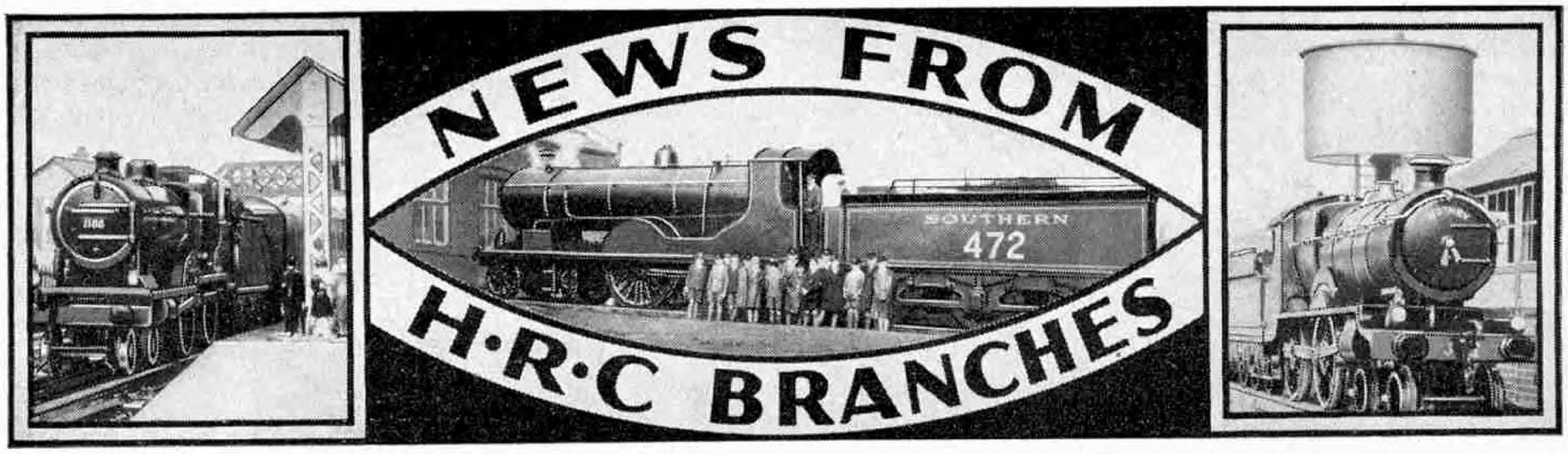
The Hornby No. 1 Special Tank provides suitable locomotive power where more or less frequent stops are made, but for longer journeys, on which fast running is required over certain sections, the No. 2 Special or E220 Special Tank Locomotive is more appropriate. In general design this engine is similar to the express tanks of most of our railways. The upper illustration on this page shows the No. 2 Special Tank Locomotive on fast suburban service on a Hornby Railway, and also gives a good idea of the massive proportions as well as the generally realistic design of these models.



Interesting working on a Hornby layout. The tank locomotive on the siding is moving forward ready to back on to the train after the Metropolitan Electric Locomotive has been detached.

Perhaps one of the most interesting features possible on a suburban line is the joint working that is very often a practice on actual railways. Indeed the coaches of one company coupled to the engine of another company is quite a common sight.

The lower illustration on this page gives a good instance of joint suburban working. In this case the operations are made more interesting by the fact that both steam and electric type locomotives are in use. The No. 2 Special Tank is just moving over from the Water Tank before taking over a train from the Metropolitan Locomotive.



Branch News

EDGBASTON.—Successful track operations have been carried out by the enthusiastic members of this Branch. All classes of traffic are worked, and the banking of express trains out of stations reproduces a realistic feature of actual railway working. A Debate on *"Road or Rail"* was decided in favour of the latter method of transport. A cricket match has been played against the Harborne (Birmingham) Branch. Secretary: P. M. Jackson, 175, Portland Road, Edgbaston, Birmingham 16.

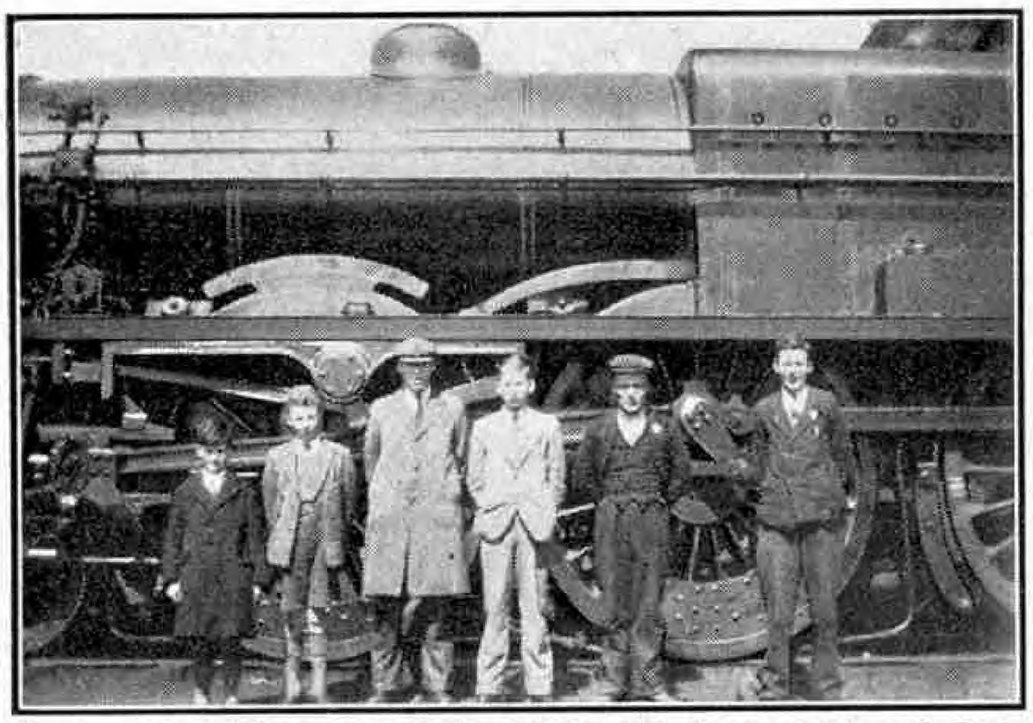
EVERGLADES (COSHAM). — This Branch has made good progress since its recent formation. In addition to Hornby Train operation, the programme includes Stamp Collecting and Games. A Library has been formed. An interesting visit was paid to the S.R. Locomotive Works at Eastleigh. Secretary: P. D. Stuart, 7, Lodge Avenue, Cosham, Hants.

ISLANDMAGEE.—This newly-incorporated but very active Branch follows an interesting and varied programme. Track work, including locomotive testing, is carried out regularly. Outdoor sports are very popular on fine evenings, and excursions on foot and otherwise are frequently made. A club magazine, *"The Gazette,"* is published in conjunction with the associated Meccano Club. Arrangements are being made for a tour of local engine sheds and stations, and preparations are in hand for a Concert. Secretary: S. McCready, "Hillmount," Islandmagee, Co. Antrim.

THE ABBEY (BURY ST. EDMUNDS).—Track meetings are held regularly, and timetable working has been introduced. A Lecture on *"Indian Railways"* proved very entertaining. A Rambling Section has been formed and several outings held. Members are to visit a local engine shed. Efforts are being made to commence a Photographic Section. Secretary: M. D. Forster, 2, Crown Street, Bury St. Edmunds.

CAMBRIDGE.—The Branch outdoor layout is at present undergoing extensive reconstruction. Locomotives and rolling stock have been thoroughly overhauled and necessary repairs effected, and paint has been applied where necessary. An electric locomotive is being constructed, careful tests being made at each stage of the work. A station also is being built. A new timetable incorporating the running of excursion trains has been drawn up. Members and visitors enjoyed a Lantern Lecture given by the secretary, the slides and information for which were kindly lent by the British Railways Press Office. An afternoon was spent at the Cambridge L.N.E.R. locomotive sheds, where members enjoyed short footplate trips. It is intended to institute an associated membership, for which those over 18 years of age are eligible. Secretary: R. P. Brooks, 4, St. Margaret's Square, Cambridge.

ACTON.—The layout has been completely renovated. A new baseboard has been constructed, and the track relaid. Improvements have been made in the design at various points, and new stations and other lineside accessories have been added. Branch rolling stock and locomotives were carefully overhauled and stored during the alterations. Excursions have been made during the session to the Willesden Motive Power Depot, the Neasden Running Sheds and other places of railway interest. Secretary: S. W. Simmons, 7, Alfred Road, Acton, London W.3.



Members of West Haddon H.R.C. Branch No. 333. Chairman, Mr. J. G. Bush, secretary, D. G. Bush, who is third from the left in the photograph. The two sections of the Branch operate electric L.N.E.R. and L.M.S. layouts respectively.

FOLKESTONE.—The Branch track was completely dismantled, and all rolling stock, locomotives, and other equipment were thoroughly overhauled before summer train operations began in July. Complicated timetable working has been carried out. Many improvements have been made on the layout, and new platforms, stations, signals and footbridges have been built. Members have re-decorated the clubroom. A model schooner has been constructed, and tried out successfully. Secretary: W. F. Cotter, 52, Hill Road, Folkestone.

ST. ANDREWS (MONTPELIER).—Meetings have been devoted to track operations involving interesting timetable running, Games and Visits. On one occasion members looked over a local printing works, and on another an interesting trip was made on a G.W.R. railcar. Members have visited the Fishponds H.R.C. Branch. Film Shows are held monthly, the films shown being both educational and amusing. Secretary: K. Bartlett, 33, Bath Buildings, Montpelier, Bristol 6.

BEDFORD SCHOOL.—Regular train working to timetable and shunting operations are carried out on the fine Branch layout, which was described in the *"M.M."* for May 1938. This is being improved in design at various points, and developments are in hand on the electrical signalling and point control equipment. A successful Exhibition has taken place, great interest being shown in the operations carried out on the track. A Cinema Show also was very popular, and the special efforts to make the programme as attractive as possible to visitors were greatly appreciated. Secretary: A. W. R. Coomber, 33, St. Michael's Road, Bedford.

DOVER.—Regular track meetings have been held, and varied running carried out on various types of layout. The running of Continental boat trains between "Dover," "Folkestone" and "Victoria (London)" was of particular interest. A Shunting Contest proved so popular that others are to be arranged. Secretary: D. F. E. Moore, 3, St. John's Road, Dover, Kent.

Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation, and any boys who are interested and desirous of linking up with this organisation should communicate with the promoters, whose names and addresses are given below.

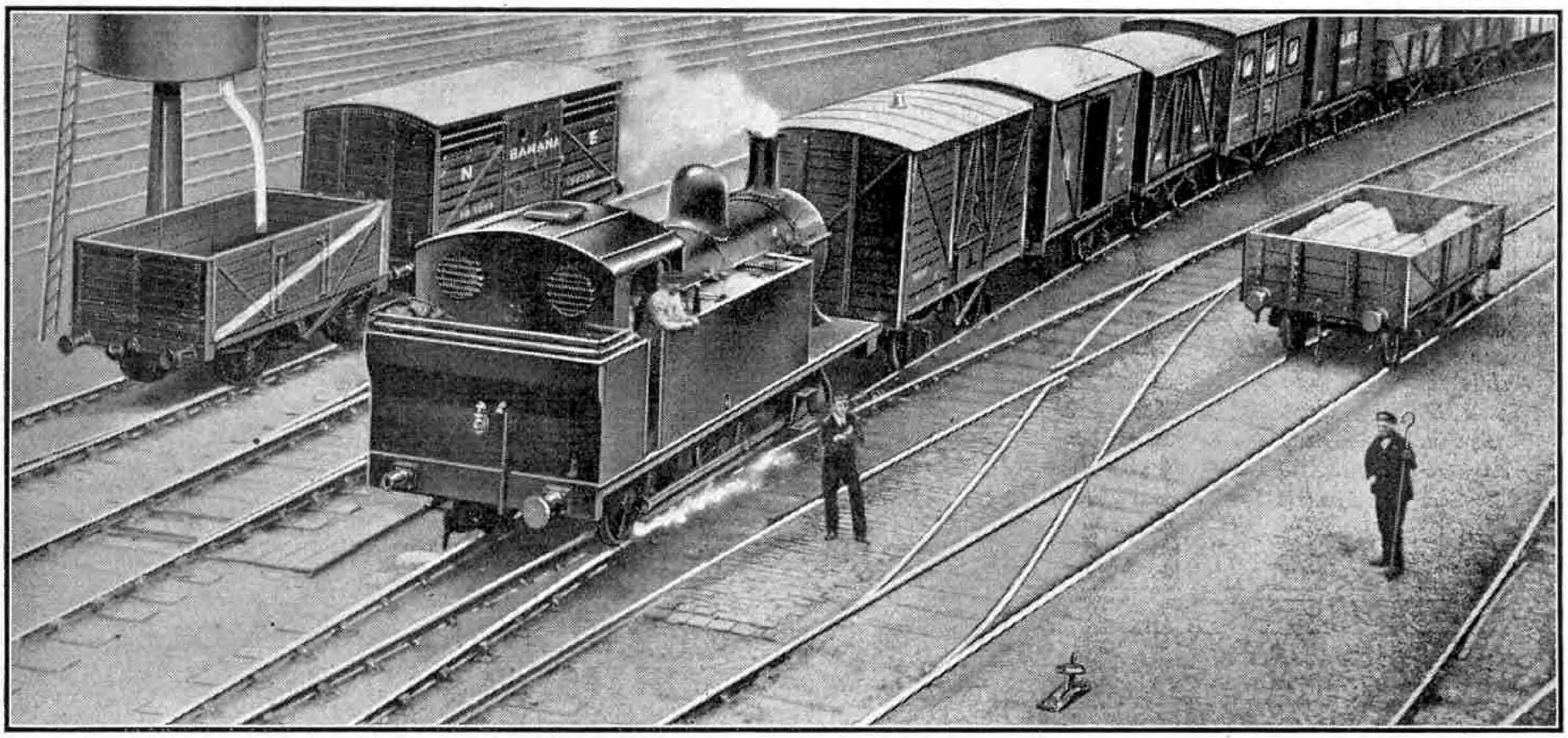
FRIMLEY GREEN—T. Clapshaw, "Mons" Tea Rooms, Frimley Green, Surrey.
HULL—F. W. Starks, 1, Clifford Street, Hull.
LONDON—D. Grant, "Glendale," 35a, Birkbeck Grove, Acton, London W.3.
LONDON—V. E. Reader, 256, Francis Road, Leyton, London E.10.
LONDON—F. Wright, 21, Princes Gate Mews, London S.W.7.
NEW MALDEN—B. Cocks, 14, Hillbrow, New Malden, Surrey.
NEW ZEALAND—K. Cassells, 26, Sugarloaf Road, Brooklyn, Wellington S.W.1, New Zealand.
OLDHAM—J. Jewitt, 3, Ronald Street, Oldham.
PORTSMOUTH—E. Wheeler, 51, Wallace Road, North End, Portsmouth.
STANMORE—M. Hall, 69, Marsh Lane, Stanmore, Middlesex.

H.R.C. COMPETITION PAGE

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

"SPOT THE ERRORS No. 1"



In March of this year we announced an "Errors" contest in which competitors had to find various mistakes specially introduced by our artist into an illustration. This contest met with such all-round approval that we have decided to run a series, and this month we announce the first of these contests.

The illustration on this page shows what appears to be an everyday goods yard scene with a 0–6–0 tank engine in the process of marshalling some freight vehicles. Close inspection, however, will reveal various mistakes, which have been purposely introduced for this contest. For instance the locomotive has only one buffer, a deficiency that in a real locomotive would make the most casual observer smile. This is an obvious error, but members will find the search for others fascinating.

The easiest way of hunting down the mistakes is to divide the illustration into sections, and to examine each one carefully, noting down the errors found in each section. When the entrant is satisfied that he has discovered all the mistakes, he should make a neat list of them, stating at the same time how each should be corrected. This should then be forwarded to Headquarters at Meccano Ltd., Binns Road, Liverpool 13, and the envelope containing the entry should be marked *"H.R.C. Errors Contest No. 1"* in the top left-hand corner.

The contest will be divided into sections, Home and Overseas, and prizes of any goods manufactured by Meccano Ltd. to the value of 21/–, 15/– and 10/6 respectively will be awarded to the senders of the three most complete entries in order of merit.

The closing date for this contest in the Home Section is 31st August. The Overseas closing date is 30th November.

Photographic Contest No. 5

This month we continue our series of Photographic Contests, in which competitors are asked to submit photographs of railway interest. Each print sent in should have on the back a description of the railway scene shown, the name, address and H.R.C. number of the sender.

The contest will be divided as usual into two sections, Home and Overseas, and prizes of Hornby Train goods or any other Meccano products, or photographic material valued 21/–, 15/– and 10/6 will be awarded.

Envelopes must be addressed to Meccano Ltd., Binns Road, Liverpool 13, and marked *"H.R.C. Photo Contest No. 5"* in the top left-hand corner. Closing date 31st August, 30th November in the Overseas Section.

April "Names" Solution

(1) *"H.L.I."* L.M.S. "Royal Scot" Class 4–6–0 No. 6121. (2) 10 p.m. Continental ferry-boat train S.R. (3) St. Pancras L.M.S. (Midland section). (4) *"The Pines Express."* L.M.S. Liverpool, Manchester, Bournemouth. (5) *"King's Own."* L.M.S. "Royal Scot." Class 4–6–0 No. 6161. (6) Elephant and Castle. (a) L.P.T.B., L.M.S., (b) S.R. (7) *"Sir Nigel Gresley."* 4–6–2 "A4" class. L.N.E.R. (8) Dudley Port. L.M.S. (9) L.M.S. "Royal Scot" Class 4–6–0 No. 6142, formerly *"Lion"*; now named *"The York and Lancaster Regiment."* (10) *"Silver Jubilee."* L.M.S. 4–6–0 "Jubilee" Class No. 5552. (11) L.M.S. 4–6–2 "Turbomotive" No. 6202. (12) Woodside (Birkenhead) G.W.R. and L.M.S. Joint Station. (13) Ferrybridge. L.N.E.R., L.M.S. (14) Dundee. L.N.E.R., L.M.S. (15) *"The Lancastrian."* London (Euston)–Manchester (London Road). (16) Hull. (a) L.M.S., (b) L.N.E.R.

COMPETITION RESULTS

HOME

May "Railway Photo Contest No. 2."—First: D. FEAR (18477), Taunton, Somerset. Second: R. J. POST (38114), London N.8. Third: T. FLETCHER (6057), Perry Barr, Birmingham 20. Consolation Prizes: F. MILLS (31), Kearsley, Nr. Bolton; D. H. WAKELY (17486), Cheam, Surrey; J. H. DENTON (52317), Tettenhall, Nr. Wolverhampton; E. W. OGLETHORPE (46851), Harrow.

May "Loco Contest."—First: A. F. COOK (218), Doncaster. Second: C. E. WRAYFORD (6039), Bovey Tracey, Devon. Third: J. F. TAYLOR (42922), Beckenham, Kent. Consolation Prizes: J. LOWE (25627), Clacton-on-Sea, Essex; G. W. CARPENTER (29078), Wembley, Middlesex; T. G. COOK (43441), Shirley, Croydon; A. S. WATTERS (30371), London N.W.10; F. MILLS (31), Kearsley, Nr. Bolton.

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25	,,	...	10d.	25	,,	,,	10d.
30	,,	...	1/-	30	,,	,,	1/-
35	,,	...	1/3	10	India	...	2d.
40	,,	...	1/6	15	,,	...	4d.
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5	Gold Coast	...	2d.	4	,, Jubilee	...	4d.
10	,, ,,	...	5d.	4	Negri Sembilan	...	3d.
15	,, ,,	...	8d.	4	Perak	...	3d.
1	,, ,, Jub.		2d.	4	Selangor	...	3d.
3	,, ,, Cor.		9d.				

J. RUSSELL,
23, SHANKLIN DRIVE, WESTCLIFF-ON-SEA.

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This amazing advertising offer includes Duplicate Album, Perforation Gauge, 100 Titles of Countries, Stamps from Philippines, set Bohemia, old Canadians, Swiss, Australians (K.G.), also Metal Watermark Detector. Finally, the beautiful set of all pictorial unused Colonials which include Waterfalls, Maps, Bridges, Ships, etc. The whole parcel absolutely free. Just send 2d. postage and request approvals.

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20 NEW ISSUES AND NOVELTIES

Including **ANDORRA** (new), Belgium, Canada, Denmark, **FRENCH EQUATORIAL AFRICA** (pictorial), **GRENADA (King George VI)**, **GREECE (Bull vaulting scene)**, Jugo Slavia, **KELANTAN** (Sultan Ismail), **MOZAMBIQUE CO. (Giraffe)**, **MOROCCO AGENCIES (King George VI, already obsolete)**, Turkey, etc. I will send this collection absolutely free to all **stamp** collectors **sending 2d. postage** (abroad 4d.).

G. P. KEEF, WILLINGDON, EASTBOURNE, ENGLAND.



NEW "S.G." SET LIST NOW READY!

IMPORTANT EVENT FOR STAMP COLLECTORS!

Publication of a brand-new (1938 Second Edition) list of all the famous Stanley Gibbons' Stamp Sets and Packets. Hundreds of brilliant offers of fine stamps such as the handsome Mozambique Company triangular air stamps illustrated (Set 4480, 10 unused, 1/8 post free), and also including many King George VI Sets. This fine list costs you nothing. Just send a postcard for it to:

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ONE THOUSAND STAMPS ON APPROVAL

From which you may select any 100 for 3/-.
This selection is not made up of the very commonest varieties, but contains stamps catalogued at 1/- each or more. (I do not sell less than 100.)
A returnable deposit of £1 is required from overseas applicants.

H. HARDY. "Hoyland." Potter Heigham. Norfolk.

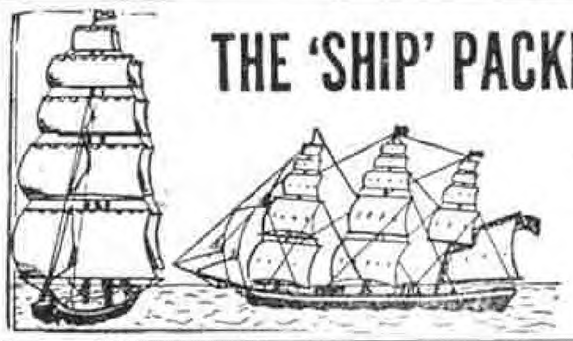
HOLIDAYS

Get this staggering **FREE** "HOLIDAY" Packet. It only contains stamps depicting various **SCENERY**, including Landscapes, Rivers, Boats, Mountains, Waterfalls, Seascapes, Lakes, Harbours and Views from all parts of the World. Several are British Colonials. All yours absolutely **FREE** by sending 2d. stamps (abroad 6d.) and requesting our famous 'Grey' Approvals. **WINDSOR STAMP CO. (DEPT. M), 59, LEE ROAD, BLACKHEATH S.E.3.**

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25 different, inc. Q. Victoria, K. Edward VII, K. George V, K. Edward VIII, K. George VI, Jubilee and Coronation. All Br. Cols. This worth-while and as described set ENTIRELY FREE. Ask Approvals enclosing postage only. ALSO FREE EXCHANGE FOR YOUR DUPLICATES. Dealers supplied.

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THE 'SHIP' PACKET



This marvellous packet is offered under cost as an advertisement, **45 different stamps each with a ship on it.** A regular armada. **KOUANG-TCHEOU**, new, **SENEGAL** (Canoe), wonderful flotilla of caravels from **DENMARK** (complete set), **NEW CALEDONIA, UKRAINE**, a fleet of **7 CHINESE** junks usually sold at 10d., **TRINIDAD & TOBAGO, MAURITIUS, KENYA-TANGANYIKA, NEWFOUNDLAND, U.S.A., B. GUIANA**, set of **S. AFRICA, GREECE, POLAND, INDO-CHINA, FRENCH OCEANIA, WALLIS & FUTUNA ISLANDS**, etc. Price **4½d.**, postage 1½d. (abroad 3d. extra). Purchasers of this packet asking for approvals receive **FREE** set of **3 SPAIN** (Columbus, each with his ship on it). Senders of addresses of stamp collectors receive **FREE** set of **6 VENEZUELA or 6 PERSIA, 100 BRITISH COLONIALS 1/-, 20 AIRPOST 6d., 6 TRIANGULARS 7d., 50 PERSIA 4/-, 9 POLAND New Pictorials 8d., VOLUMES OF B.O.P. CHEAP.**



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10 U.S.S.R. or Airs and Pictorials free with approvals. G. Whittleton, 3, Cavendish Street, Worcester.

SET 3 BRAZIL and Perforation Gauge in 50 packet stamps. Postage 2d. Request approvals. Colley, 72, Tweedy Road, Bromley, Kent.

BARGAIN PARCEL FOR 1'6

100 page album with 360 illustrations, and spaces for 4,000 stamps, 100 stamps including NEW ISSUES, 300 mounts, perforation gauge, Gem Case for duplicates and transparent envelopes.
For 30 days, abroad 60 days, we offer this BUMPER PARCEL to our approval sheet applicants. (Postage abroad 6d. extra.)
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100 DIFFERENT STAMPS FREE to applicants for ½d. approvals. Cox, 14, Broadmead Av., Worcester Park.

1/6 Used Australian "Hermes," to genuine applicants for appros. from ½d. Walker, "Plaisance," Hildenboro'.

MAGNIFICENT NEW ISSUES FREE!

"CHOOSE YOUR OWN . . ."

For this month's special offer we are presenting one of any of the following George VI sets. Basutoland, Bechuanaland, Falkland Isles, Fiji or Swaziland. One of these sets absolutely free to all serious applicants enclosing 2d. postage for our famous Westminster Blue Books containing Pictorials, Coronations, Jubilees. Stamps you will be proud to own! Alternatively, approval applicants may purchase all the five sets at the same time for 1/- only post free.

WESTMINSTER STAMP CO. BANK CHAMBERS, 32a, STRAND, LONDON W.C.2.



Stamp Gossip

and Notes on New Issues



Italy Commemorates Great Emperor

The 2,000th anniversary of the birth of the great Roman Emperor, Augustus, has been celebrated in a number of the Italian Colonies by the issue of a short series of commemorative stamps bearing designs similar to the 5c. Libian issue, reproduced here, which is based on a statue of the Emperor.



Augustus, or as he was first named, Caius Octavius, was the great-nephew and heir of the Emperor Julius Cæsar. Following the assassination of his uncle in the year 44 B.C., he took the name Caius Julius Cæsar Octavius, but he was involved in many struggles before at length in 31 B.C. he was universally accepted as Emperor. The name Augustus was later accorded to him by the Romans as an hereditary title of honour in recognition of the brilliance of his reign. He died in the year 14 A.D. aged 74.

His name is perpetuated in the calendar, the eighth month of the year, August, having been named Augustus in his honour by the Romans.

* * *

We illustrate on this page the recently issued Esthonian 2k stamp which provides a splendid picture of the harbour at Tallinn, the Baltic port which is capital city of Esthonia.





Britain's Stamp Sales

Readers who are interested in statistics can find much to ponder over in these figures showing sales of G. B. stamps for the year ended 31st March last, revealed in a Post Office report.

The total value of postage stamp sales was £42,797,000 made up as follows:—½d., 2,785,904,392; 1d., 1,155,430,372; 1½d., 2,925,063,140; 2d., 413,227,680; 2½d., 80,491,200; 3d., 102,532,080; 4d., 62,292,480; 5d., 31,242,240; 6d., 123,809,760; 9d., 16,289,040; 10d., 5,785,440; 1/–, 27,793,920; 2/6d., 1,915,991; 5/–, 1,044,518; and 10/–, 252,353.

These figures include sales of overprinted stamps, such as the stamps used in the Morocco Agencies.

Death of Sir Edward Bacon

Philately has lost another of its great men in the passing of Sir Edward Denny Bacon, K.C.V.O., who died on 6th June at Croydon. For nearly 25 years he had been curator of the great collection formed by the late King George V.

Sir Edward was born in 1860 and had collected stamps from his boyhood days. He joined the Royal Philatelic Society in 1860, and served as its President for several years. He was responsible for the arrangement and cataloguing of the magnificent Tapling collection housed in the British Museum, and he continued as curator of that collection up to the time of his death.



He was appointed to the care of the King's stamps in 1913, and spent three days each week at Buckingham Palace supervising the maintenance of the Royal collection. This was housed in several hundreds of volumes and was contained in a room set apart for their accommodation. Sir Edward had a completely free hand in the purchase of additions to the collection, although King George was accustomed to spend at least one afternoon each week with Sir Edward to discuss the collection and possible acquisitions.

The collection was the late King's personal property, and it is understood that his will provided for its continuance and desired that Sir Edward's appointment as curator should be confirmed. A Court Circular, dated 20th June, announced the appointment of Sir John Wilson, Bart., as "Keeper of the King's Philatelic Collection," to fill the post rendered vacant by Sir Edward's death.

New Designs for Burma

We are indebted to Mr. T. Sike Shu for the information that the selection committee appointed by the Burmese Government to choose designs for Burma's definitive stamp issue has just completed its task. The number of designs submitted to the Committee was 252 and the first prize was awarded to a 22-year old Burmese youth for his design "Royal Barge." Prizes were awarded to three other designs typifying "Burma Rice," "Burma Teak" and "The Irrawaddy."

American Anniversaries in Stamps

This month we are able to reproduce a specimen from the Swedish issue commemorating the establishment of the Swedish colony on the banks of the Delaware River in North America, to which we referred in the June *"M.M."* Our illustration is of the 5 öre value, in which John Printz, the leader of the settlers, is shown negotiating with an Indian chief for the purchase of a piece of land.

The United States also have marked this celebration by the issue of a 3c. stamp showing the landing of the colonists from their ships *"Kalmar Nyckel"* and *"Fagel Grip."*

Another interesting recent United States commemorative is the 3c. issue celebrating the 150th anniversary of the ratification of the Constitution. The Constitution was framed at a convention held in Philadelphia in May 1787, and it was agreed that its adoption was contingent upon its acceptance by at least nine of the States. One by one various States signified their approval, and the Constitution passed from project into accomplishment when New Hampshire gave approval in June 1788. The design of the stamp depicts the scene outside the New Hampshire House of Assembly, in which the ratification ceremony took place, as horsemen departed to spread the news of the Constitution's adoption. We hope to illustrate this stamp, and also the Swedish-American 3c. stamp, mentioned above, in our next issue.

Salvador has followed the example of Poland in issuing a stamp to commemorate this important event in American history, which had a great international significance; and we reproduce here the very striking 30c. stamp issued for the occasion.



We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.

SUMMER SALE—BARGAINS

CORONATIONS: Mint sets—Morocco 5d., N. Zealand or Cooks 11d., Papua 1/2, Nauru 1/8, N. Guinea 2/1, Antigua, Bahamas, Caymans, Barbados, Bermuda, Dominica, Grenada, Jamaica, Leewards, Turks, Montserrat, Trinidad, Virgins, 7½d. each (13 sets West Indies 7/6).
COLLECTION—1 from each Colony (45 stamps) 5/-
USED SETS: Fiji, Montserrat, N. Rhodesia at 10d., Caymans, Falklands, Nyasaland at 7d.; Cooks (Registered covers) 1/2.
All in stock—quotations for any Colony.
8 COLONIAL JUBILEES to genuine approval applicants enclosing 2d. for postage, stating requirements.
T. R. HUGHES (P.T.S.), 'IBIS COTTAGE,' AMERSHAM, BUCKS.

NOT RUBBISH

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100 all different, 2 Indian Silver Jubilees and 1 Mozambique Triangular Air Mail
To introduce my low-priced approval books containing stamps from ½d. Liberal discount given, and a list of 133 further bonus gifts of Coronations, Jubilees, Commemoratives. Please send 2d. for postage.
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Readers are urged to observe the following points when writing to advertisers:

1. **Mention the "M.M." and any special reference number quoted in the advertisement. This helps the advertisers to give prompt attention.**
2. **See that the full amount of the price and any postage is included. It is unfair to expect advertisers to fulfil their undertakings promptly if short remittances are sent.**
3. **GIVE YOUR FULL ADDRESS.**

THE ADVERTISEMENT MANAGER,
MECCANO MAGAZINE, BINNS ROAD, LIVERPOOL 13.

"Muffled Pinking is a menace

because it goes on unnoticed, reducing engine efficiency, and developing engine trouble if it is not discovered and rectified in time."

SIR MALCOLM CAMPBELL

Avoid it by using . . .



THE NEAREST THING TO FLYING.

A SPEEDY TOY FOR THE HEALTHY BOY

Perfect steering. Two brakes ensure safety and the Steel chassis, strength.
Price **40/-**

MONTIL FLYING ACE COASTER



From most Stores, or full particulars from
MONTIL MFG. CO. LTD.
Morville St., BIRMINGHAM

Build your own engine

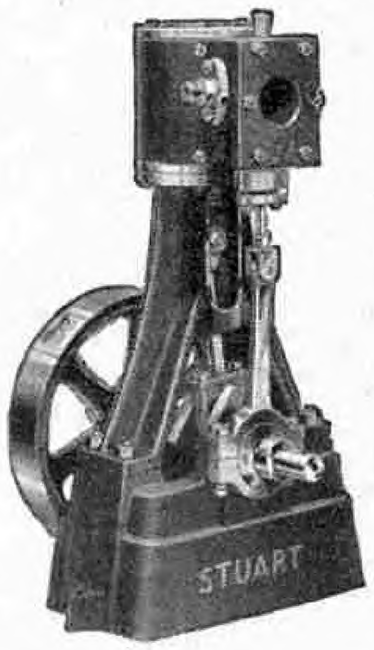
Only a few hand tools required.

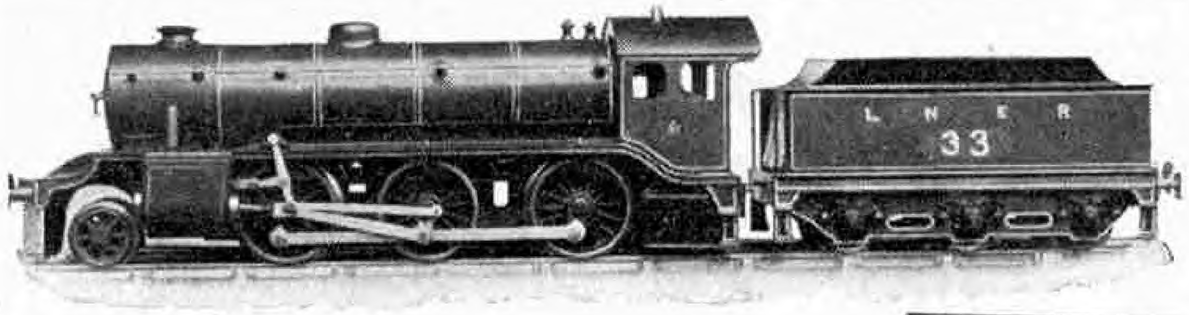
Stuart No. 10.
Completely machined set with full instructions:
from **18/6** post free.

All our sets from **5/-** upwards, illustrated and described in our No. 2 catalogue, 6d. post free.

72 pages fully illustrated.

STUART TURNER LTD.
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OUR AUGUST BARGAIN

and a chance to build yourself a Mogul type locomotive!

Every boy likes to build a steam locomotive and here is a unique opportunity of doing this without needing machine tools or expensive kit.

We offer a set of finished parts for building a gauge 1 steam Mogul and the model only needs to be assembled with the necessary screws, solder, etc., and you can finish it in your favourite colours ready for the run!
Full description of how to build the locomotive included with the parts.

FIVE SETS ONLY AVAILABLE — usual price 11 gns. — Special price this month — Cash with order 7 gns.

Other gauge 1 locomotives described in A.17 Railway Catalogue.

SEND FOR THESE!

A.17 New Model Railway Catalogue **6d.** **B.17** In two Sections. B.1. Engine and Finished Fittings. B.2. Raw Materials and Parts. **3d. each**
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Gauge 1 coaches to suit the above — all steel with corridor connections, either 1st or Brake 3rd L.M.S., L.N.E.R. or G.W.R.
Special Price - **18/6**
S.R. hand painted ... **25/-**
Of special interest.—Gauge 1 sets of wood parts for building Wagons. List on application.

BASSETT-LOWKE LTD., NORTHAMPTON
LONDON: 112, High Holborn, W.C.1 **MANCHESTER: 28, Corporation Street**

New French Pictorials

There has been unusual activity among French stamp issues in recent weeks and some interesting new pictorial designs have been produced. Four of the new high values have appeared, these being a 2f. 15 stamp showing a group of French colliers leaving a pit-head, the background giving a striking representation of a pit-head gear and belching chimneys; a 5f. value that provides an excellent picture of the ramparts and eleventh-century castle at Carcassonne, famous for withstanding a siege by the Black Prince; a 10 fr. value showing the Donjon of Vincennes; and a 20 fr. value bearing a view of St. Malo.



Early in April a 65c.+35c. issue, bearing a portrait of Jean Charcot, was issued in aid of the Shipwrecked Mariners' Society, and almost simultaneously there appeared a 55c. stamp to commemorate the centenary of the birth of Leon Gambetta. Charcot earned fame as an explorer in the Antarctic, where he made many important discoveries. He and 39 members of his crew were lost when his ship, the *"Pourquois-pas?,"* was sunk in a storm off Iceland in September 1936.

Leon Gambetta was the founder of France's present form of Government, having been responsible for the formation of the third Republic after the Battle of Sedan. Unfortunately the brilliant promise of his early career was unfulfilled, for he lost his life in a shooting accident when only 44 years of age.



On 9th May a series of six stamps were issued in aid of the Unemployed Intellectuals Relief Fund. Each of these stamps bore a portrait of a famous Frenchman as follows:—30c., Anatole France; 35c., Jacques Callot; 55c., Hector Berlioz; 65c., Victor Hugo; 1 f. Auguste Rodin; 1 f. 75, Louis Pasteur.



On the same day was issued a 1 f. 75 stamp, illustrated here, bearing a splendid picture of the main front and entrance gates of the Palace of Versailles, while late in June appeared another tourist propaganda stamp, a 3 fr. value featuring the Palace of the Popes at Avignon.

The tercentenary of the birth of Dom Perigon, inventor of the champagne wine-producing process, was celebrated by the issue of a 1 f. 75 stamp on 13th June. The design, one of the most striking French issues in recent years, as our illustration suggests, depicts a girl dressed in the traditional costume of the Champagne, holding a glass of the famous wine as though in the act of giving a toast.

A 1 f. 75 stamp was to have been issued on 28th June to commemorate the official visit of King George and Queen Elizabeth to Paris. The design of this stamp was to show a view of the Houses of Parliament in London and the Arc de Triomphe in Paris, linked by a seal portraying two hands clasped over an olive branch and bearing the date "28 Juin 1938." As our readers know, Her Majesty was bereaved only a few days before the date of this proposed State visit to France and in consequence the visit was postponed until 19th July. In consequence the issue of the stamp was withheld until the new date, but owing to the impossibility of preparing in time a new issue bearing the revised date, either as a fresh design or by overprinting, the original design with the June dating was used. Specimens of this stamp were not available in time for reproduction in this issue.

Finally, there is to be issued a 55c.+70c. charity stamp to assist in raising funds for the erection of a memorial at Lyons to the officers and men of the French infantry forces who fell in the Great War. The design will show a French "poilu" standing in a trench.

The Roll of Distinguished Philatelists

This year's ceremony of signing the Roll of Distinguished Philatelists, one of the outstanding incidents of the annual Philatelic Congress of Great Britain, held this year at Cambridge 21st—24th June, was notable for the admission of a woman philatelist for the first time. Miss Winifred Penn-Gaskell, on whom this honour has fallen, is Vice-President of the Air Mail Society and a leading specialist in air mail stamps and covers.

The Stamps of Atlantis

Readers who are offered stamps purporting to be issues of the Empire of "Atlantis and Lemuria" should be on their guard. It seems that a body of Scandinavians engaged in developing the group of islands known as Lemuria, lying in the Pacific Ocean to the west of the Isthmus of Panama, have prepared a crude stamp issue for use on outgoing mail and have announced their intention of applying to the Postal Union for recognition in 1940.

It is unlikely that the Islands are not already under the sovereignty of one or another of the world's nations, and the status of the "Atlantis" stamps must remain in doubt until the ownership of the islands is established. No private group of people may issue stamps; that is the prerogative of sovereign states only. The position, in fact, is identical with that of the Lundy Island issue, made by the owner, Mr. M. C. Harman, which was withdrawn on the intervention of the British Government.



British Colonial George VI Issues

The flow of Colonial new reign stamps has now reached its peak and within a very few weeks will virtually have finished. The most interesting of the new designs that have appeared since we last reviewed these new issues is from Trinidad and Tobago. As may be seen from our reproduction of the 6c. value, the old popular designs have been adapted very cleverly to a larger format to permit the inclusion of the King's portrait. A 4c. value now introduced takes the Memorial Park design previously used on the 48c. value, which is dropped from the range. The 72c. value also has been discontinued, its place being taken by a new 60c. value using the "Blue Basin" design.



Cyprus is another Colony that has retained the majority of its old designs, the only alteration in the majority of its 13 new issues being the incorporation of the King's portrait. The 4½ p. value, however, uses the map of Cyprus design that was last seen on the 1½ p. value of the 1928 Jubilee series. New designs are a view of the "Citadel," Othello's Tower, at Famagusta on the 9 p. value, illustrated on this page, and a head and shoulders portrait of King George VI on the 90 p. and £1 values.

Sierra Leone has introduced the first five values of its new series. These show two new designs, a rice harvesting picture, shown here, being used for the 1½d. and 2d. values, and a view of Freetown, as seen from the harbour, appearing on the ½d., 1d. and 3d. stamps.



Newfoundland has issued four new designs bearing royal portraits, from which we have chosen for illustration the 4c. value with its excellent portrait of Princess Elizabeth. Of the other designs, the 2c. shows King George VI, the picture being identical with that chosen for the South-West Africa Coronation issue, illustrated in the July 1937 *"M.M."*. Queen Elizabeth is shown on the 3c. stamp, this portrait being the same as on Australia's current 1d. value; and Queen Mary appears on the 7c. value, the portrait being the one used on the 3c. value of the Newfoundland 1932 issue.

The Cayman Islands have produced an entirely new range of five designs, spread over 12 stamps as follows:—½d. and 1s., Caribbean dolphin; ¼d., 1½d. and 2s., a beach view at Grand Cayman; 1d. and 3d., map of the Islands; 2½d. and 5s., a Cayman schooner; 2d., 6d., and 10s., a beach view with hawksbill turtles and coconut palms.

The Ascension Islands issue has retained the 1934 pictorial designs, the words "Postage and Revenue" being deleted, however.

Thrills and Spills at Torquay Motor Boat Regetta

Splendid motor boat racing was seen in difficult weather conditions at the Torquay International Regatta in July. On the first day an on-shore wind made racing impracticable, and all events were postponed except a heat in the Atlantis Trophy contest for runabouts. Friday's programme was consequently very full. Racing started at 11 a.m. and continued until dusk, although the water was very choppy until the evening, when the surface improved. On the Saturday the races took place in comparatively calm water.

The chief event of the Regatta was the race for the Duke of York's Trophy, run in three heats of 30 miles each, for which there were six entrants. Really fast racing was witnessed in this contest, especially from two American and two Canadian Ventnor hydroplanes, and the Trophy eventually went to E. Mortimer Auerbach, one of the Americans. The winner's best speed was 52.69 m.p.h.

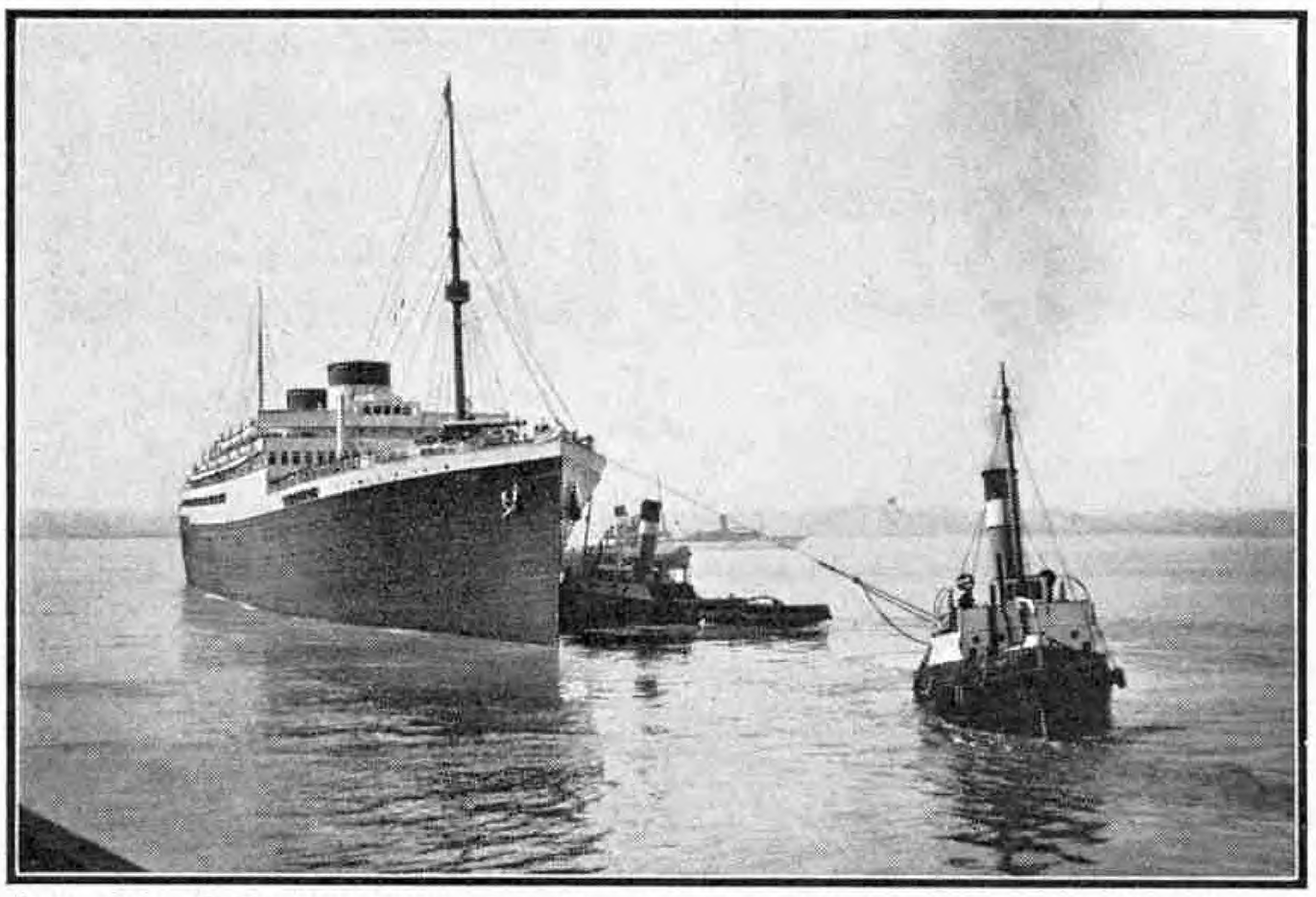
Another event of great interest was *"The Yachting World"* 100-mile Marathon Race, comprising 50 laps of a two-mile course. This race was open to inboard and outboard craft weighing not more than 1½ tons. Smaller craft were given several laps start, and theoretically all boats should have finished together. One by one boats dropped out, however, until at the end only four were left. The winner was T. Wisdom, the well-known motor car racing driver, who piloted a 16 ft., 95 h.p. standard Chris-Craft runabout, his average speed being 34.5 m.p.h.

In the contest for the Atlantis International Gold Trophy, a race for standard runabouts, the winner was a 17-ft. Chris-Craft boat, with an 95 h.p. engine, piloted by Mrs. T. Wisdom. In this contest the pilots try to complete each lap of the course in exactly the same time, the boat with the smallest variation winning the Trophy. Mrs. Wisdom's times showed only a total variation of 52 secs., and the runner-up, T. Culpan, in a 16-ft. Chris-Craft racing runabout with a 121 h.p. engine, won the cup for the fastest time.

Probably most excitement was occasioned by the *"Star"* Trophy Race for outboard hydroplanes. The spectators were thrilled by the performances of these tiny craft and equally impressed by the noise they made.

The race was run in three 8-mile heats over a one-mile course. D. Margariti, a visiting Frenchman, unfortunately caught the wash of a passing boat when leading in the first heat and overturned. G. Holt, of the Lancashire Hydroplane Racing Club, in a boat of his own design and make, and R. Lebrun, another Frenchman, then fought out the race, the latter eventually getting the upper hand. In the second heat Holt had a comparatively easy win, but in the third Margariti got away very quickly and led to the finish. Holt was second, and as he obtained most points for the three heats, was awarded the Trophy.

One of the best starts of the meeting took place in *"The Motor Boat"* Trophy Race for the 4-litre class. A hot pace was set, and this soon told, various mishaps disposing of three of the entrants. Eventually the American Ventnor *"Gen V"* won at a speed of 43.86 m.p.h.



Outward bound! The Cunard White Star motorship "Britannic," of 27,000 tons, in charge of tugs at Southampton as she leaves for New York. Photograph by J. W. Billinge, Brighton.

Motor Launches for Chasing Torpedoes

The British Power Boat Company Ltd., Hythe, Southampton, recently handed over the first of a new type of fast motor launch ordered from them by the Royal Netherlands Government. Torpedoes are very expensive things, far too costly to be lost unnecessarily during practice operations.

The special purpose of these boats is to follow them as they are discharged, overtake them when they begin to slow down from their initial speed of 40 knots, and recover them at the termination of their run. Only 10 seconds was required to accelerate the boat from a standstill to maximum speed, and she could be stopped in two lengths. During the official trials, which occupied two hours, the boat underwent an hour's manœuvring tests, including six runs over the measured mile. From all accounts she seems to have behaved excellently in every way, and she should be as comfortable at sea as it is possible for a boat of this type to be.

The new launch has a designed speed of 35 knots, but on her official trials, which took place in Southampton Water, she reached a speed of 38 knots. In dimensions the boat is closely similar to the "Power" Royal Air Force tender with a length of 37 ft. 6 in., a beam of 8 ft. 6 in., and a draught of 6 ft. 10 in. The design of the hull has been modified to enable a greater speed to be obtained, however, and two 8-cylinder Scripps engines, developing 200 h.p. at 2,400 r.p.m., are fitted. The engines, which drive the propellers direct, are installed in separate compartments on each side of the large after cockpit. The reverse gears are controlled by levers in the forward cabin, and the throttles are actuated by chain cable. The levers for reverse and throttles are so arranged that both can be operated with one hand, either separately or together.

The boat has a fuel capacity of 70 gallons, affording a range of about 70 miles. She crossed from Southampton to The Hague under her own power.

The Thrills of Yacht Racing—

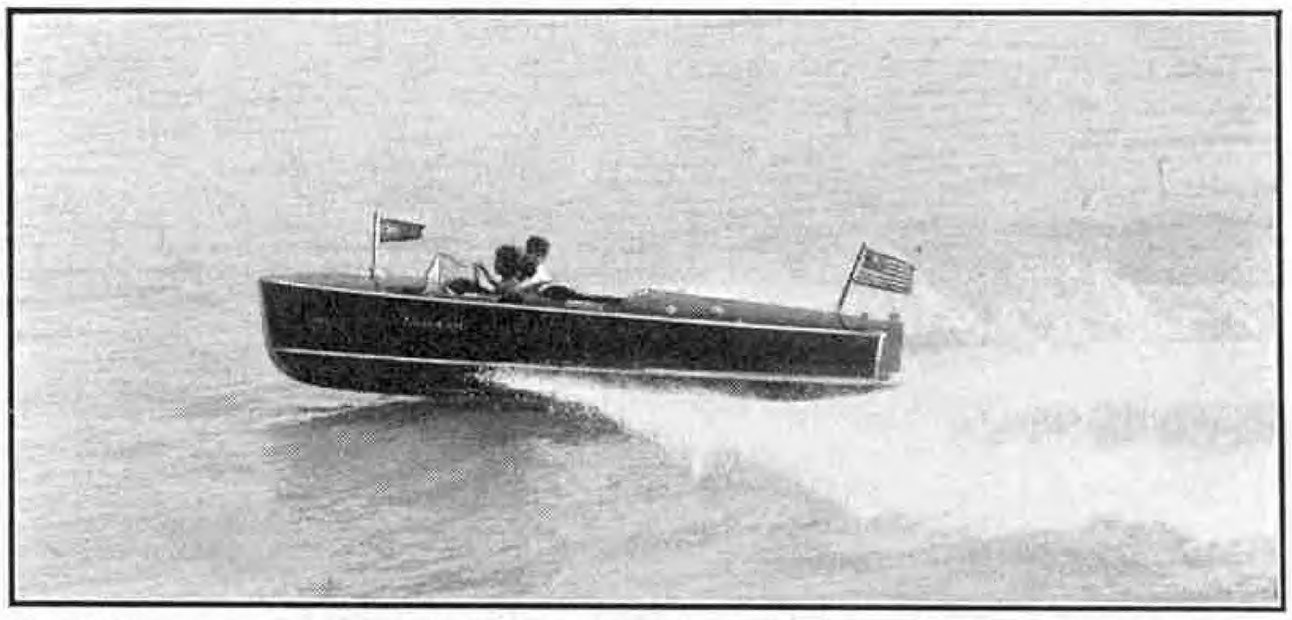
(Continued from page 425)

went on for several hours, and in the end we picked up a new breeze and again came abeam of the fleet, now racing for the last two miles to the finishing line in Cowes Roads. Yard by yard we gained, only to lose way again as the breeze failed. Three hundred yards from the line up came a stronger breeze from another quarter. Hastily re-trimming sails, *"Velsheda"* was first to get her long bow ahead of her rivals, to win a long and sporting race and the King's Cup by only seven seconds.

"Flying Scotsman" — Old and New—

(Continued from page 423)

we touched 94 m.p.h. and we continued for 10 miles at an average of 89.8 m.p.h.—with a 510-ton train. But Peterborough really marked the end of the day's speeding. The busy state of the line did not permit of a faster schedule, and we were already well ahead of time. Driver and locomotive were not to be restrained however, and in spite of a signal check at Biggleswade we covered the 87.8 miles from Grantham to Hatfield in 88½ minutes. Congestion increased as we neared London, but we managed to wriggle through without any appreciable loss of time and coasted up to the buffer-stops at King's Cross abreast once again of No. 1, and the 1888 train. So ended a memorable day.



The ideal summer sport. A 16-ft. Chris-Craft runabout at full speed. Photograph by courtesy of Arthur Bray, London N.W.1.

Competition Corner

What Advertised Products are Represented Here?

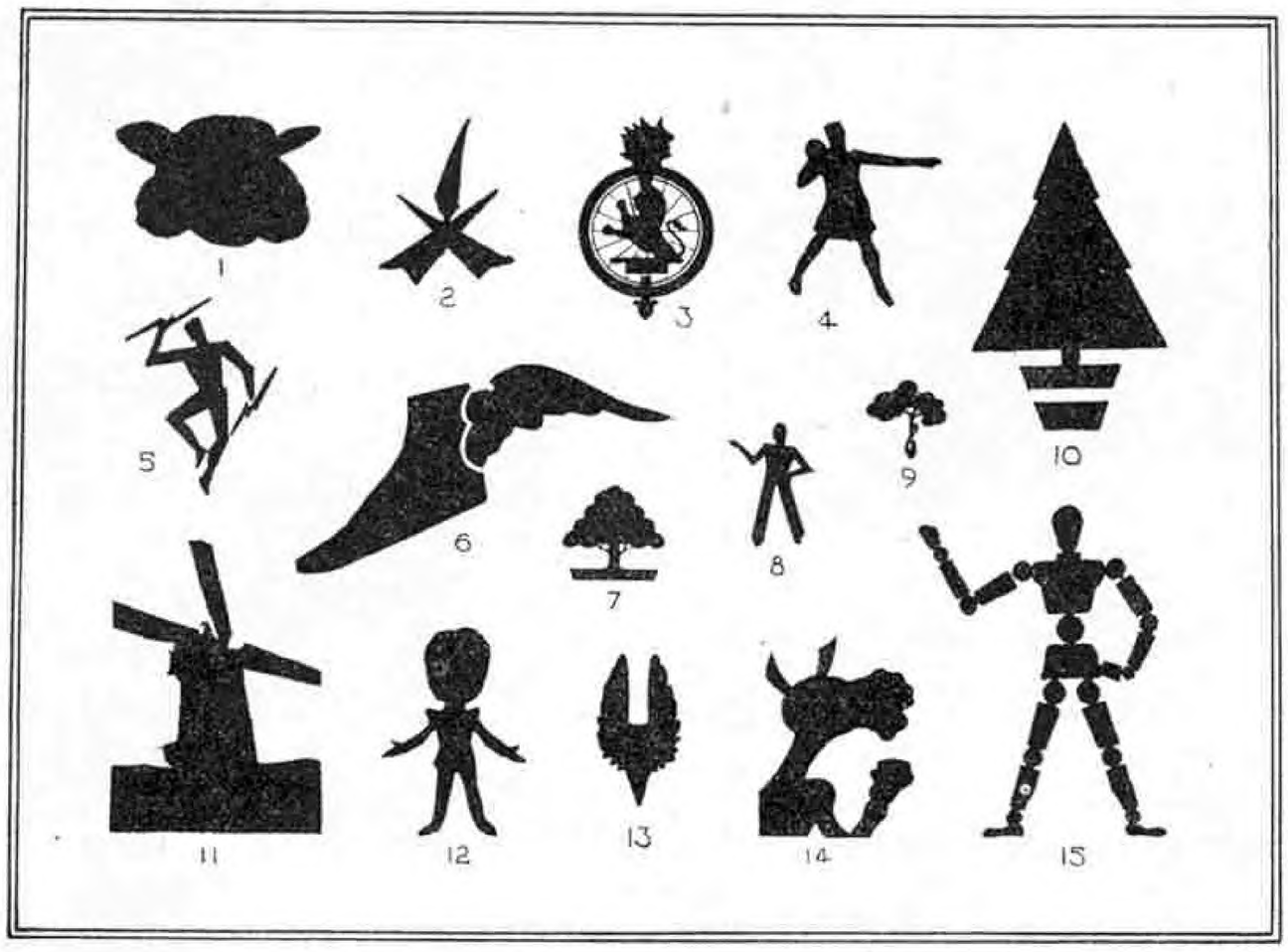
Some years ago we held several competitions in which readers were invited to identify a range of advertised products represented by silhouettes of mascots and symbols used in the advertising of those products. These competitions aroused great interest, and we think our readers will revel in another of the same type.

The figures shown in the accompanying illustration are silhouettes of well-known symbols used in present day press and poster advertising, and competitors are required to state the product advertised by each symbol and the name of the advertisers marketing that product.

In submitting entries in this competition, it is not necessary to cut the illustration from the page; instead entries should be numbered to correspond with the numbers shown against the silhouettes themselves.

The competition will be divided into Home and Overseas Sections, in each of which prizes of Meccano products to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the senders of the four most accurate lists in order of merit. In addition there will be a number of consolation prizes. The term "Meccano products" covers all goods produced by Meccano Ltd., and the winners will be allowed to choose whatever they wish to the value of their prizes from the current Meccano price lists. In the event of a tie for any of the prizes, preference will be given to the entry displaying the neatest or most novel arrangement. The number of correctly identified items will be the first test, however.

Entries must be addressed: "Silhouettes, Meccano Magazine, Binns Road, Liverpool 13," and must reach this office not later than 31st August. The closing date for Overseas entries is 30th November 1938.



August Photo Contest

Each month this summer we are holding a Photographic Contest in which every reader is eligible to take part. The prizes are offered for the best photographs submitted during the month, without any restrictions as to the subject or the size of the picture, or the make of camera, plate, film or printing paper. The only requirements are that the exposure must have been made by the competitor, and the print must bear a title.

The developing and printing may have been done professionally, but entrants who have done this part of the work themselves are asked to write the words "own work throughout" on the backs of their entries. In the event of a tie for any prize, preference will be given to a print that is solely the work of the competitor.

Each month's entries will be divided into two sections, A for readers aged 16 and over, B for those under 16, and prizes of Meccano products or photographic materials, as chosen by the winners, to the value of 21/– and 10/6 will be awarded in each section. There will be a number of consolation prizes in addition.

Entries to this month's competition should be addressed: "August Photo Contest, Meccano Magazine, Binns Road, Liverpool 13," and must reach this office not later than 31st August.

U	B	I	Q	U	I	T	O	U	S	■	M	O	R	I	O	N
P	■	M	■	R	■	U	■	■	L	O	O	T	■	N	■	E
B	R	A	G	G	A	R	T	■	U	■	S	T	I	G	M	A
R	O	G	U	E	■	B	■	T	I	T	L	E	■	L	■	T
A	B	E	T	■	T	A	X	■	C	H	E	R	O	O	T	■
I	■	■	T	A	R	N	■	T	E	R	M	■	B	R	I	G
D	E	L	U	D	E	■	■	R	■	I	■	■	S	I	R	■
E	■	■	R	E	S	T	■	I	N	V	E	N	T	O	R	■
D	I	S	A	P	P	E	A	R	■	E	■	■	R	U	E	D
■	S	U	L	T	A	N	■	E	■	■	T	R	U	S	T	■
L	O	P	■	■	S	T	A	M	P	■	R	O	C	■	■	A
■	L	E	A	P	S	■	S	E	A	K	I	T	T	I	E	S
L	A	R	G	O	■	S	■	■	L	I	M	A	■	M	■	H
O	T	H	E	R	W	I	S	E	■	P	■	T	■	P	■	E
R	E	E	S	T	A	T	E	■	O	P	P	I	D	A	N	S
D	■	A	■	A	R	E	A	■	■	E	■	O	■	I	■	■
S	U	T	I	L	E	■	T	E	T	R	A	N	D	R	I	A

The solution of the March Crossword Puzzle is given herewith, the Overseas Section having closed. The awards in the Overseas Section are given elsewhere on this page.

Continued from previous column

There will be separate sections, with prizes of the same values, open to Overseas readers. Overseas entries to this month's contest must arrive not later than 30th November.

COMPETITION RESULTS

HOME

"June Crossword Puzzle."—1. T. D. Tasker (Barnsley). 2. R. Connors (Boston Spa). 3. A. V. N. Priest (Codnor). 4. P. Redfern (Etwall). Consolation Prizes: J. F. O. Mitchell (Edinburgh 10); T. Webster (Wakefield); N. H. Brittan (Newcastle-upon-Tyne 4); F. Mills (Kearsley); A. C. Robb (Upton, Wirral).

"June Photo Contest."—First Prizes: Section A, A. G. Dell (London S.E.27); Section B, K. Ingles (London N.13). Second Prizes: Section A, F. Mills (Kearsley); Section B, P. G. Lund (Leicester). Consolation Prizes: R. W. Bradley (Honeybourne); T. Brooks (Halifax); J. R. Tottle (Taunton).

OVERSEAS

"March Crossword Puzzle."—1. E. A. Bunt (Capetown). 2. V. P. Senji (Madras). 3. R. W. Roddick (Rosario de Sta. Fe). 4. C. J. Mallia (Pawla, Malta). Consolation Prizes: E. Worthington (Vancouver); J. Wollenboven (Delft, Holland); J. Lyons (Penang, Straits Settlements); C. Keekok (Singapore); C. P. Barnard (Johannesburg).

"March Drawing Contest."—First Prizes: Section A, J. M. Demanuele (Valletta); Section B, V. P. Senji (Madras). Second Prizes: Section A, P. F. Smith (Australia); Section B, L. Hurter (South Africa).

NOTE TO INTENDING COMPETITORS

Entrants to photographic and similar competitions are asked to note that unsuccessful entries can only be returned if a stamped addressed cover is sent with the entry.

In sending entries to competitions that are divided into age groups, competitors should take particular care to mark their ages clearly on the back of the entry. It is not sufficient merely to indicate the age group, as age allowances are given to ensure equality of opportunity for the younger competitors.



MEAN

Homeless Hector: "I went to that house over there and asked for something to keep body and soul together."

Weary Willie: "And what did you get?"

Homeless Hector: "A safety pin!"

* * * *

Skipper of yacht to amateur owner: "This is the Forth Bridge, sir."

Owner: "That's funny—when did we sail under the other three?"

* * * *

Waiter (to regular customer): "What do you want to-day, sir?"

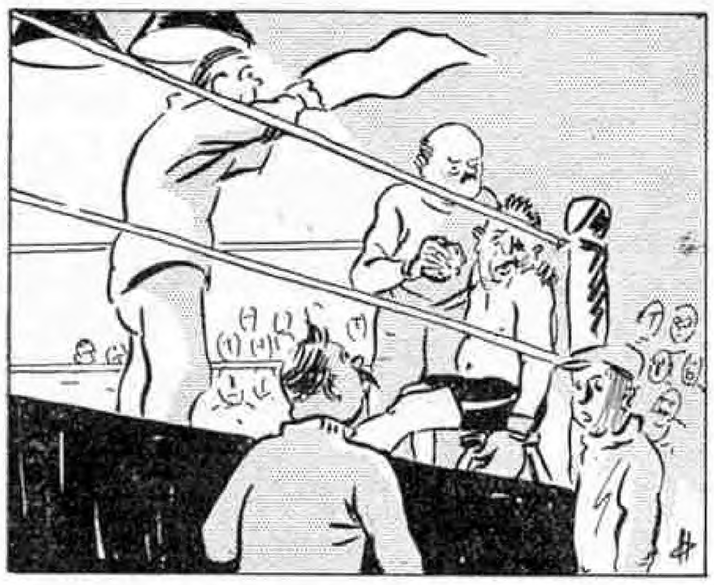
Customer: "Steak, please."

Waiter: "Same as yesterday?"

Customer: "Well, I don't mind having another go at it; that is, if it's not 'out' already."

* * * *

BLIND MAN'S BUFF



Second: "Go in and finish him this time."

Fighter: "I can't see him."

Second: "Then hit him from memory."

* * * *

Lady Pupil (after smash up): "Do I need much more before I am able to drive?"

Dejected Instructor: "About half a dozen more."

Lady Pupil: "Lessons?"

Dejected Instructor: "No, cars."

* * * *

"Are you a clock-watcher?" the employer asked a man applying for work.

"No, I don't like inside work," replied the applicant calmly, "I'm a whistle-listener."

* * * *

Seasick Passenger (on racing yacht): "I say, what about going back? After you've seen one wave you've seen them all."

* * * *

Diner: "How long will my chop be?"

Waiter: "Well, sir, if you're lucky, maybe it will be four inches."

* * * *

Landlady: "You'll have to pay your bill or leave!"

Lodger: "Thanks awfully. My last landlady made me do both."

* * * *

Murphy was paying twenty-eight shillings a week board and lodging. One day his landlady said, "Pat, I'm afraid I shall have to charge you another two shillings a week. You're such a big eater."

"For the love ov Mike, don't do that," implored Murphy. "I'm killin' myself already trying to eat twenty-eight shillings' worth."

* * * *

Brown: "Some people thirst after fame and others after money."

Green: "I know something everybody thirsts after."

Brown: "What's that?"

Green: "Salt fish."

* * * *

The Angler: "Is this a public lake, my man?"

The Inhabitant: "Aye."

The Angler: "Then it won't be a crime if I land a fish?"

The Inhabitant: "No, it'll be a miracle."

LESSON FOR TWO

"Hey, boss!" shouted the office boy, rushing into his employer's office. "How about gettin' off this afternoon to go to a cricket match?"

"William," said the boss, "that is no way to ask. Sit here at my desk and I will show you how."

The employer closed the door behind him; then knocked and entered with his hat in his hand, saying, "Please, Mr. Smith, may I go to the cricket match this afternoon?"

"Sure!" said the boy, "Go ahead. Here's 2/- for the ticket."

* * * *

Applicant for office boy's job: "I may say I am pretty smart; I have won several crosswords and word picture competitions."

Employer: "Yes, but I want someone who could be smart during office hours."

Applicant: "This was in office hours, sir."

* * * *

"That's a massive statue, my man."

"Yes, sir. The hand is just eleven inches across."

"Is that so? I wonder why they didn't make it twelve?"

"Because then it would have been a foot."

* * * *

"The Browns called their new house 'The Nutshell,' but they had to change it."

"Why?"

"The boys kept asking at the door if the colonel was in."

* * * *

Johnny was having his music lesson.

"And what," asked his teacher, "does ff mean?"

"Fump, fump," said Johnny.

* * * *

"What is the difference between an angler and a lazy schoolboy?"

"Dunno?"

"One baits his hook and the other hates his book."

* * * *

Rustic: "Well, sir, I allus do as my father did—keep my money in t'owd stockin' at 'ome."

Vicar: "But you lose the interest that way."

Rustic: "No, I don't, sir; I puts a bit extra away for that."

* * * *

Mother: "Sonny, step over and see how old Mrs. Harris is this morning."

Sonny (coming back): "Seventy-three years, six months, and two days, muvver, she says."

* * * *

Customer: "Have you any apples?"

Grocer: "Do you want them to cook or to eat?"

Customer: "Both."

* * * *

OBVIOUSLY



Farmer: "Hi, what are you doing in that apple tree?"

Small Boy: "I've just fallen out of an aeroplane."

* * * *

THIS MONTH'S HOWLER

An oboe is an American tramp who plays in a B.B.C. Dance Band.

CONTINUOUS PERFORMANCE

First Navvy: "Ye know, it's hard lines on Joe, 'im bein' so short-sighted."

Second Navvy: "Why?"

First Navvy: "'E can't see when the foreman ain't lookin', so 'e 'as to keep on working all the time."

* * * *

Teacher: "Willie, why are you late for school?"

Willie: "I slept in. I dreamt I was going to America."

Teacher: "Very well. Johnny, what's your excuse?"

Johnny: "I dreamt I was seeing him off."

* * * *

Visitor: "Is this village lighted by electricity?"

Villager: "Only when there's a thunderstorm."

* * * *

The famous detective arrived at the scene of the crime.

"Gracious," he said, "this is more serious than I thought. This window has been broken on both sides."

* * * *

HE KNEW!



"I want to buy a toy train for my little boy."

"Next floor please, sir, 'Men's Hobbies'!"

* * * *

An absent-minded professor went into a shop to buy a jar. Seeing one that was upside-down, he exclaimed: "How absurd! The jar has no mouth!"

Turning it over, he was once more astonished. "Why, the bottom's gone, too!"

* * * *

Dentist: "Then you won't have gas, sir?"

Patient: "Certainly not! I'm the director of an electricity company."

* * * *

Mother (at tea): "Why didn't you wash your hands, Johnny?"

Johnny: "I didn't think it mattered, mummy, 'cos we're having brown bread."

* * * *

Teacher: "What happened in the year 1809?"

Johnny: "Lincoln was born."

Teacher: "Correct. Now, what happened in 1812?"

Johnny (after a pause): "Lincoln had his third birthday."

* * * *

"When I was a boy," said a grey-haired physician, "I wanted to be a soldier, but my parents persuaded me to study medicine."

"Oh, well," consoled his neighbour, "such is life. Many a man with wholesale ambitions has to content himself with a retail business."

* * * *

Prison Visitor: "So you are here for seven years. What's the charge?"

Convict: "There's no charge. It's all free here."

* * * *

Two country youths were on a visit to London. They went into the British Museum and saw a mummy, over which hung a card on which was printed, "B.C.87."

They were mystified, and one said: "What do you make of that, Sam?"

"Well," said Sam, "I should say it was the number of the motor car that killed him."



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FOR real speed with absolute road-holding at every turn and on every surface, there isn't a tyre in its class to compare with the Dunlop Speed. It has a scientifically designed tread that takes you along faster with less effort and at the same time holds tenaciously to the road, preventing side-slip and skidding. If you haven't yet tried the Dunlop Speed examine it today at your dealer's. He'll strongly recommend it — for *durability* as well as speed and safety. Available in translucent, black, or red with translucent sides.

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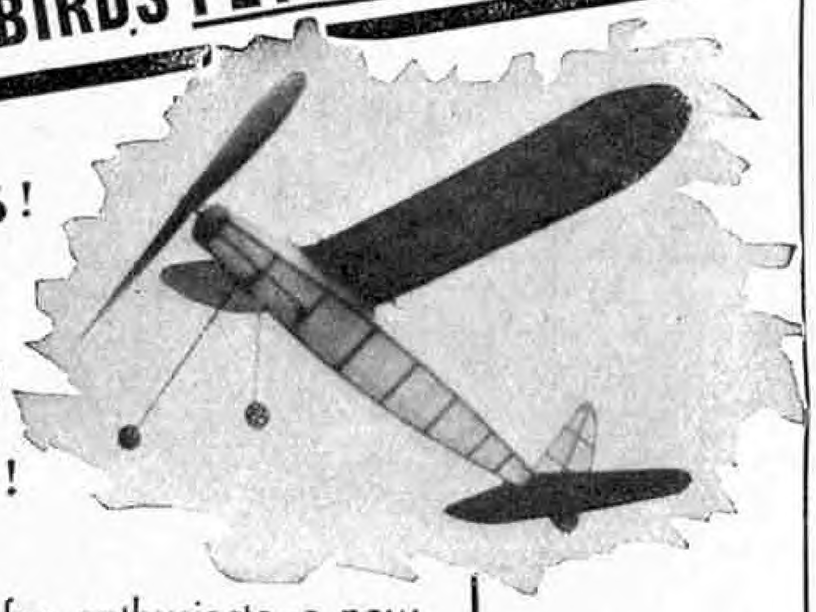
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LOOPS!
TURNS!
LANDS!



Good news for enthusiasts—a new SKYBIRD model that gives you DOUBLE satisfaction!
The "STURDY" . . . build it yourself AND fly it! It loops, swerves, turns, lands, etc., just like the real thing! Simple construction—excellent performance. British built for British weather.
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THE **"STURDY"**
Complete constructive set:
Span 30 ins.
Length 21½ ins.
Price **6'6**

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YOU CAN'T OVERWIND THE FILM
YOU CAN'T BREAK THE BODY . . .



You can't help but get good pictures with the V.6!

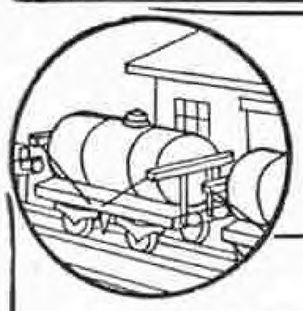
Even if you've never used a camera before the Brilliant V.6 will get perfect pictures for you. The hooded finder shows you the picture almost full-size while you take it and for speed work there's the sports-finder which lets you "shoot" from eye-level. An automatic brake stops you from overwinding the film. A hold-all built into the side carries light filters, etc. The body is unbreakable. You get 12 pictures 2¼" square on standard 8 exposure 3¼" x 2¼" film. You get perfect lens and shutter equipment. You get, in short, a luxury camera for as little as £2-15-0! See the V.6 at your dealer's or write below for details.

The BRILLIANT V.6
Six models ranging from £2-15-0 with F/7.7 Voigtar lens to £8-2-6 with a F/3.5 Voigtar lens in Compur-Rapid shutter.

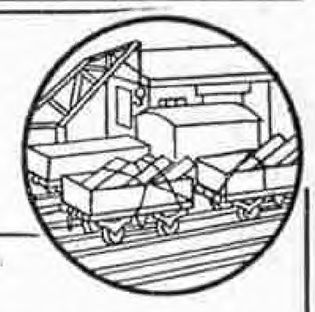
Voigtländer

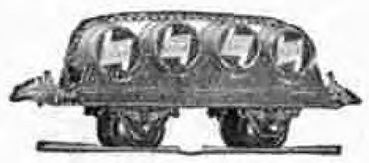
SCHERING LTD. (Voigtlander Dept. 7)
185/192, HIGH HOLBORN, LONDON, W.C.1

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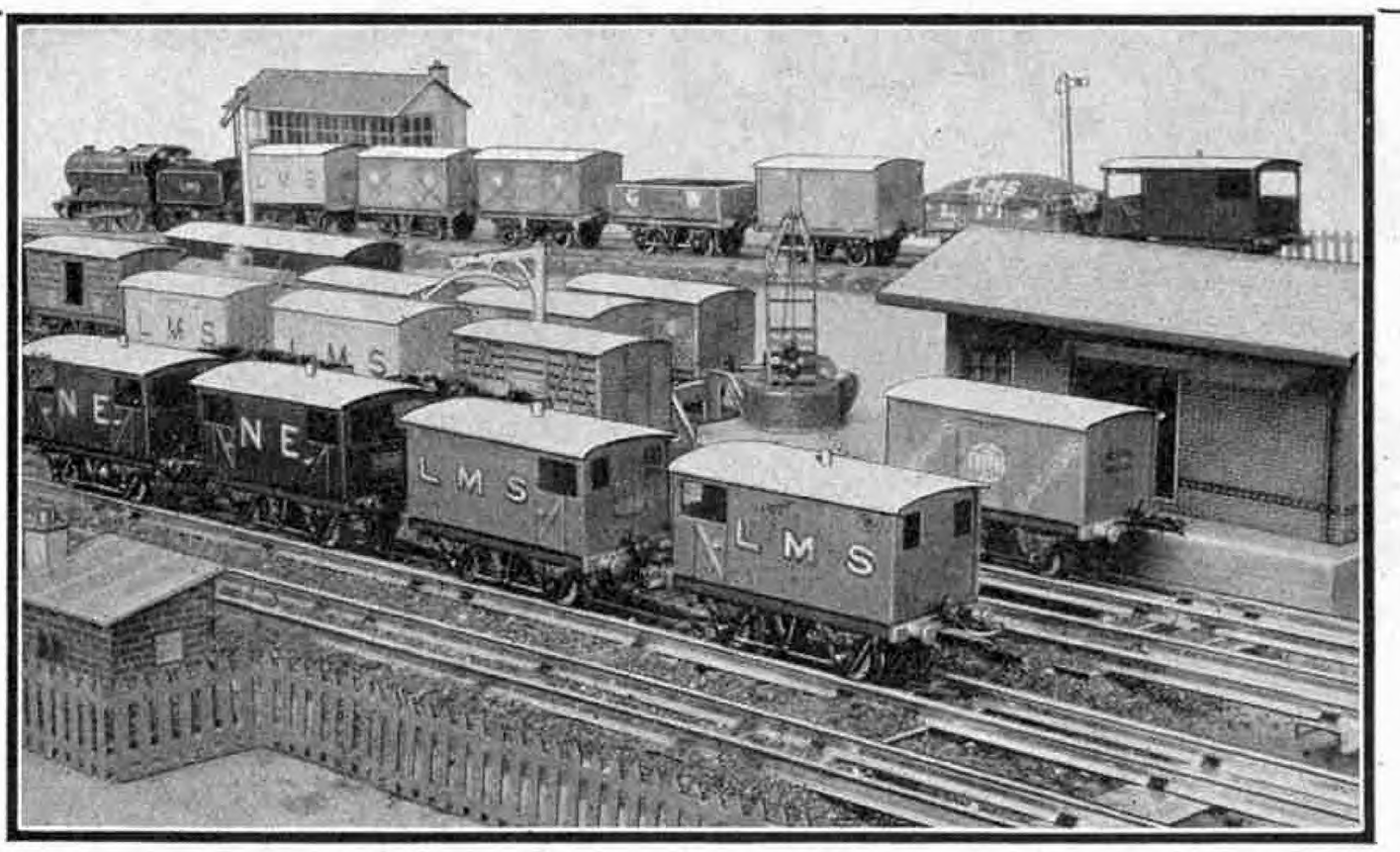


HORNBY ROLLING STOCK





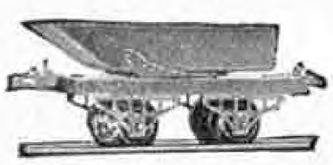
BARREL WAGON
This is an interesting model of a type of wagon used in France and other European countries.
Price **2/6**



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An attractive selection of Hornby Rolling Stock is illustrated and described on this page. Ask your dealer for a complete price list.



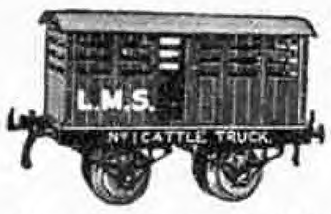
No. 1 ROTARY TIPPING WAGON
Finished in orange.
Price **2/-**



No. 0 ROTARY TIPPING WAGON
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CHOCOLATE VAN "CADBURY'S"
This van is beautifully enamelled in blue with white roof.
Price **2/3**



***No. 1 CATTLE TRUCK**
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Price **2/3**



***HOPPER WAGON**
Mechanically unloaded.
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This is a distinctive model. Available lettered N.E., G.W. or L.M.S. Price **1/6**

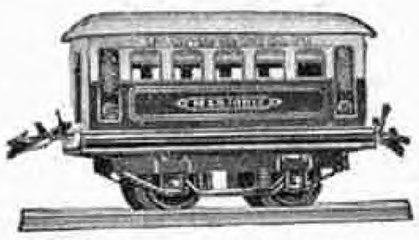


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Finished in correct colours of G.W.R. and L.M.S. "Loco Coal" Wagons, or L.N.E.R. "Brick" Wagon. Not suitable for 1 ft. radius rails.
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Price **1/3**



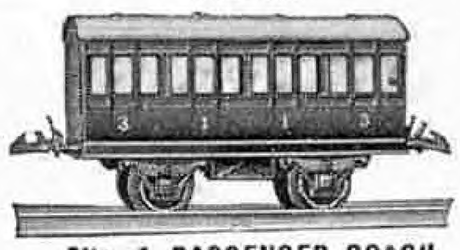
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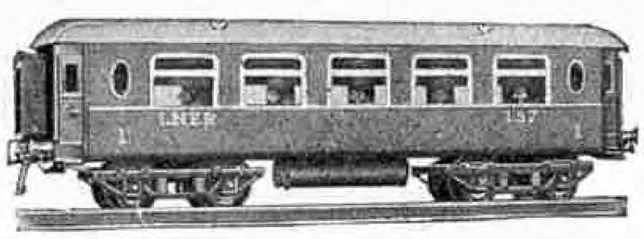
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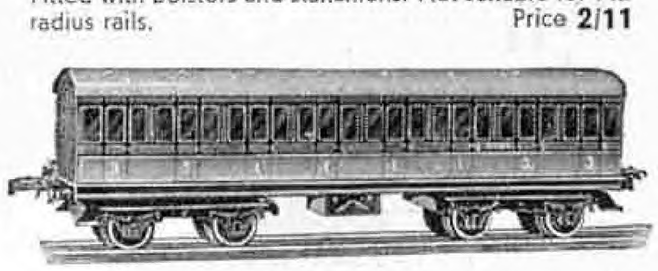
COAL WAGON
Fitted with embossed representation of coal.
Price **2/3**



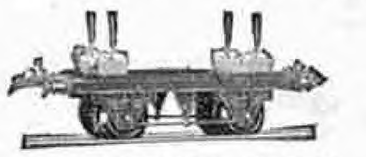
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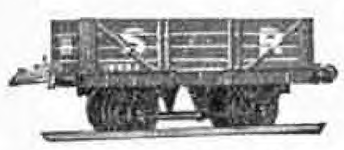
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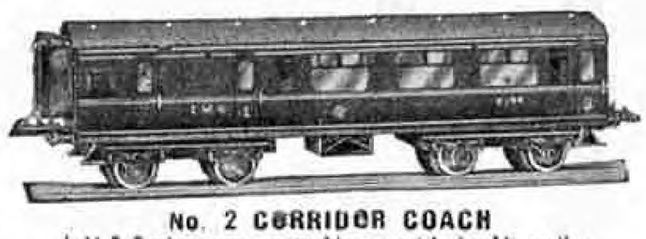
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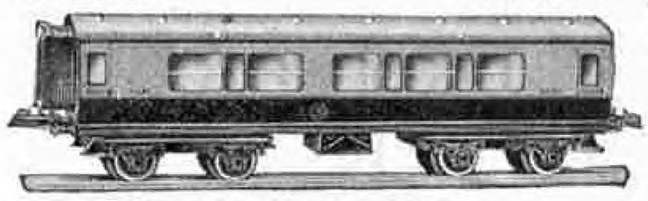
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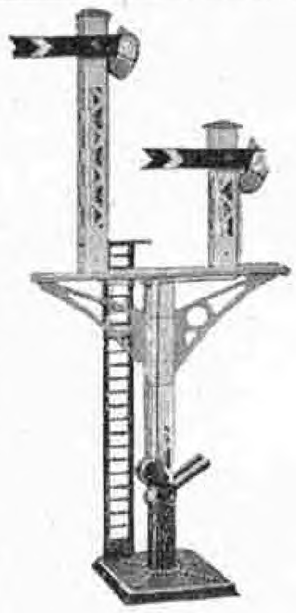
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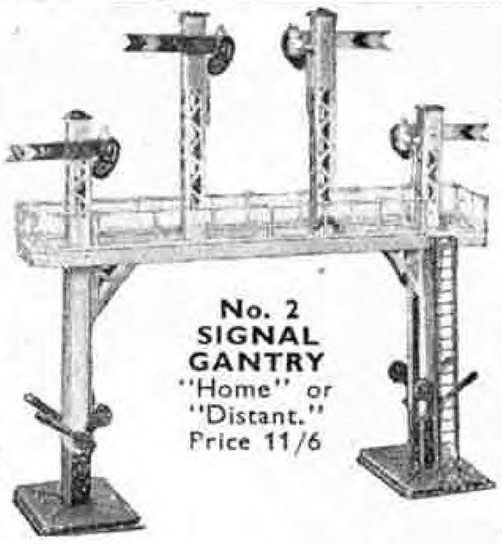
No. 2 JUNCTION SIGNAL
"Home" or "Distant." Signal arms operated by levers at base. A very realistic mode Price 5/–



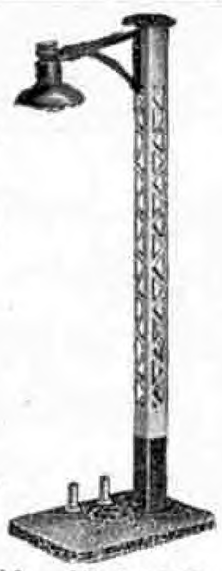
TELEGRAPH POLE
Price per pair 3/–



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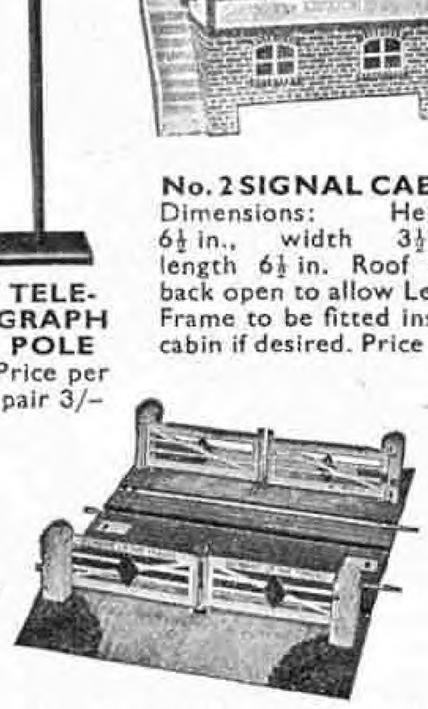
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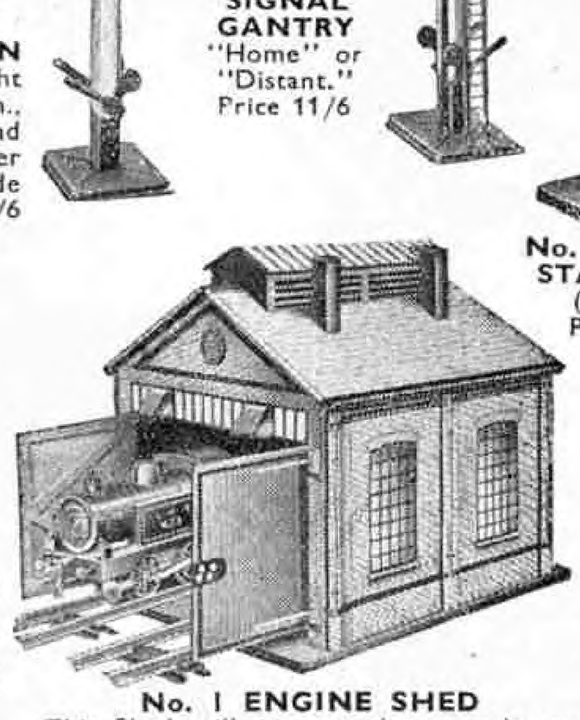


No. 2 LEVEL CROSSING
Measures 13½ in. x 10½ in., with two tracks of gauge O rails in position, as illustrated. Price 5/3

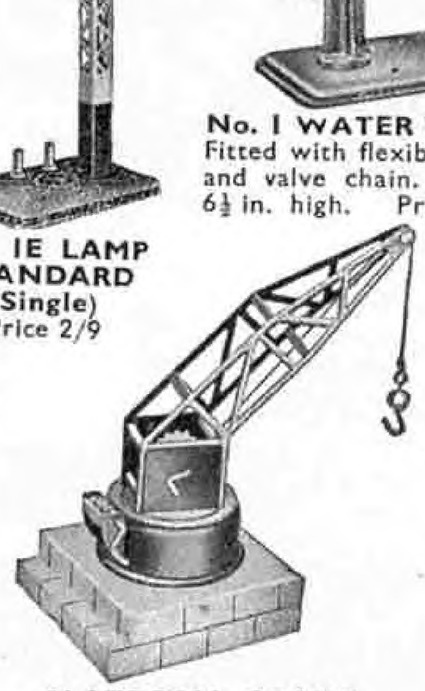
No. 1 LEVEL CROSSING
Suitable for single track only. Price 2/11



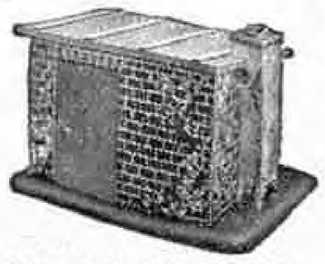
No. 1 BUFFER STOPS
(Spring type). Price 1/–



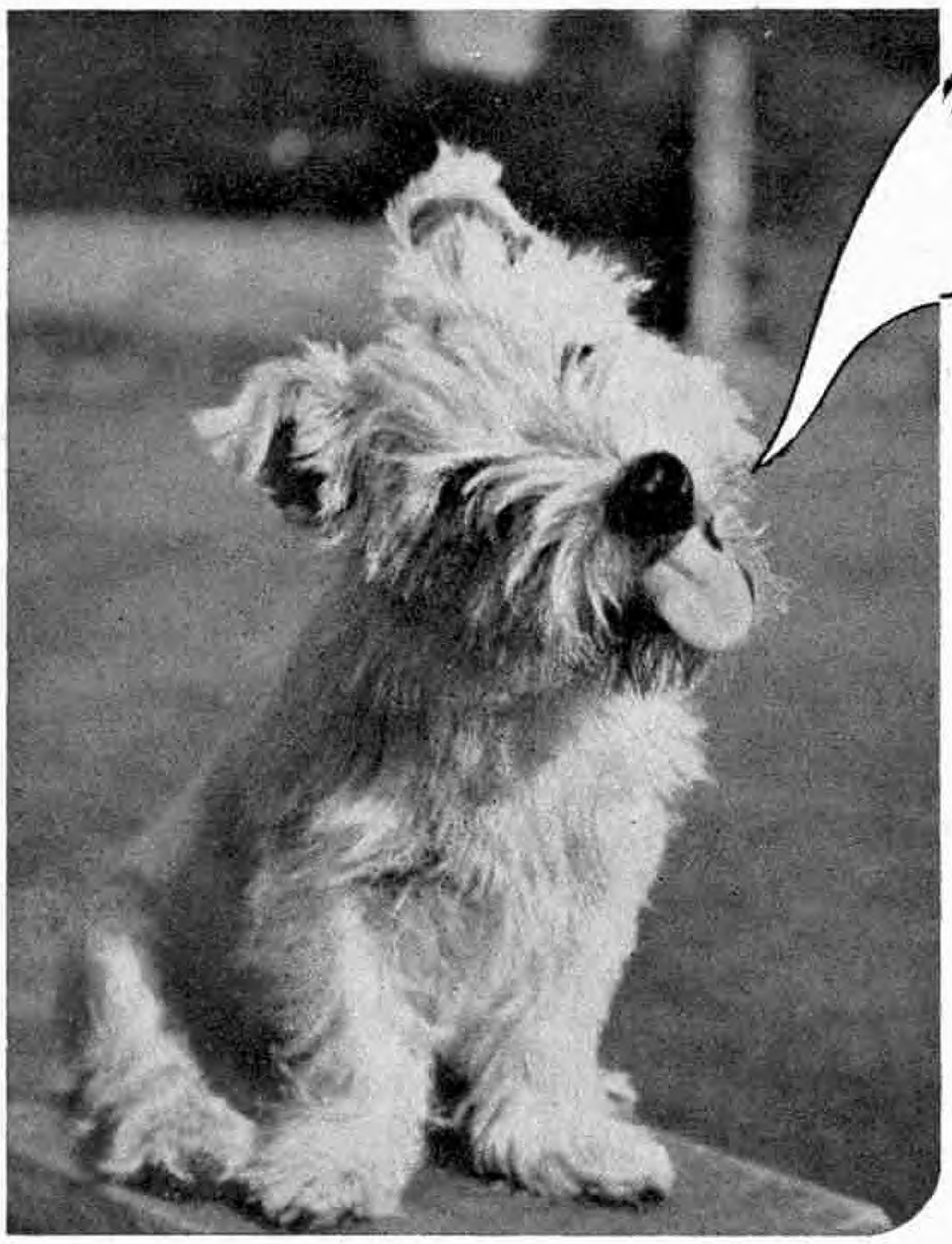
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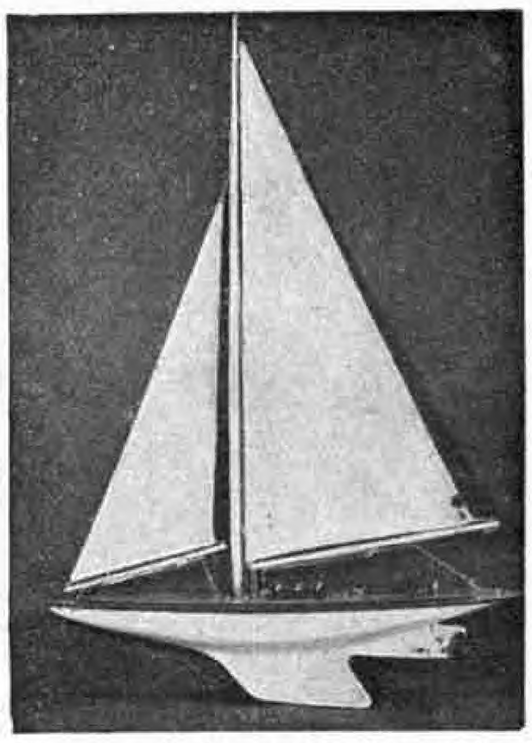
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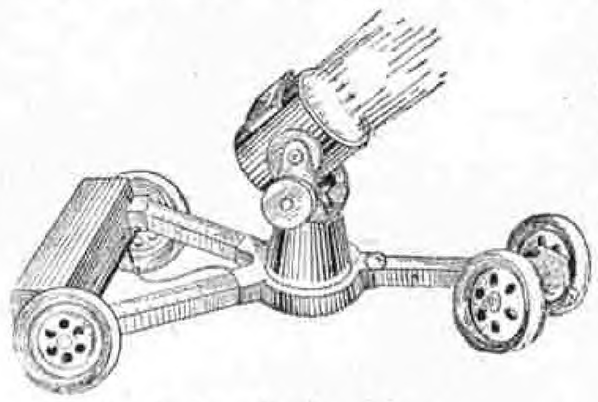
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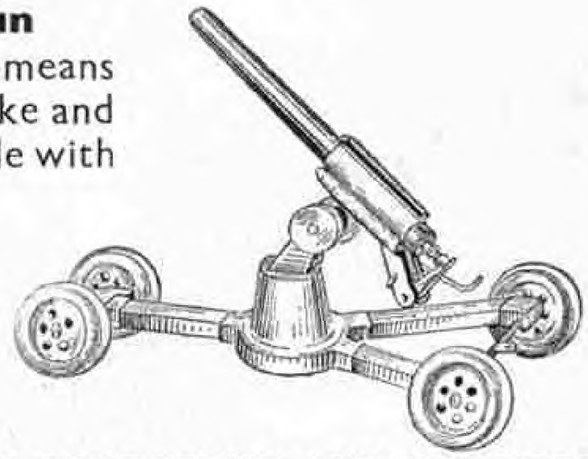
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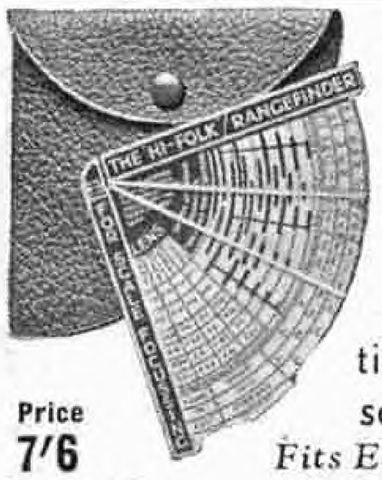
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READERS' SALES

Readers should note that all advertisements of Hornby Trains and other Meccano products included in this column relate to items no longer featured in the catalogue. Advertisements of current products cannot be accepted for this column.

Wanted. Red-Green Meccano, about No. 5 or 6 Set.—Montgomery, Auchencairn, Castle-Douglas, Scotland.

Zeiss Ikon 100 W 16 mm. Projector. Good condition. £6/10/–. Demonstration if near. 110 to 270 AC/DC.—Whitehead, 13, Mayton Street, Holloway, London N.7.

Telescope, 2¼ O.G. Eyepiece 20, 25, 30x, 50/–, new condition. Astro Telescope 3" O.G. Astro and Terrestrial Eyepieces, £4/10/0—11, Craigton Rd., Eltham, S.E.9.

Sale. Two No. 3 Sets Red-Green Meccano and extras, value £4. Take 25/– or offer. Gramophone Motor, offers?—Jarrett, 132, Craven Road, Newbury.

Large Collection of Books for sale. £2. Cheap.—Scott, Tweedenhead, Newcastleton, Roxburghshire.

Sale. 66 "M.M.'s," Dec. 1929–36, 22/–, or nearest offer. Diana Airgun, 15/6–7/6.—McInnes, Seaview Café, Lancing.

Model Yacht, 4 ft. long, excellent condition. Cost £10. Accept £3.—238, Gloucester Terrace, Paddington W.2.

Sale. Cigarette Cards. "Meccano Magazines," 1930-1933. Offers?—Clarke, 29, Land Lane, Marston Green, Birmingham.

For Sale. Gauge "O" Clockwork. Large variety of Engines, Carriages, Tracks and Accessories. Perfect condition, very cheap. List free.—A. McConnell, 40, Eglinton Road, Donnybrook, Dublin.

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Sale. "M.M.'s," 1931-7 inclusive, excluding 1934. £1 or nearest. Postage extra.—Archer, Gamelin, Llangollen, Denbighshire.

Sale. Stamp Collection in good Album, 25/–. Clockwork Motor, 5/–. Pocket Microscope, 3/6. Details—Payne, 39, Revell Road, Kingston, Surrey.

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For Sale. Kodatoy. Hardly used. Cost 63/–. Sell 43/–.—Fanghanel, 10, Layer Gardens, W.3.

Stamp Collection, 1,043 different, includes "Poached Egg," Coronations, bargain, 10/6. Royal Barlock Typewriter, perfect, suit learner, 55/–. Stamp particulars.—Milton, 68, Butler Road, Dagenham.

Sale. Bassett-Lowke "Iolanthe" Clockwork Boat, 27 inches. Cost 35/–. Scarcely used. Best offer above £1.—Archer, 8, Grantham Avenue, West Hartlepool.

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To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

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Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

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Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/2 per copy (postage extra), and the subscription rates 8/– for six months and 16/– for 12 months (post free), Canada, where the price is 10c. per copy, and the subscription rates 65c. for six months, and $1.25 for 12 months (post paid).

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Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the United Kingdom and Northern Ireland. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

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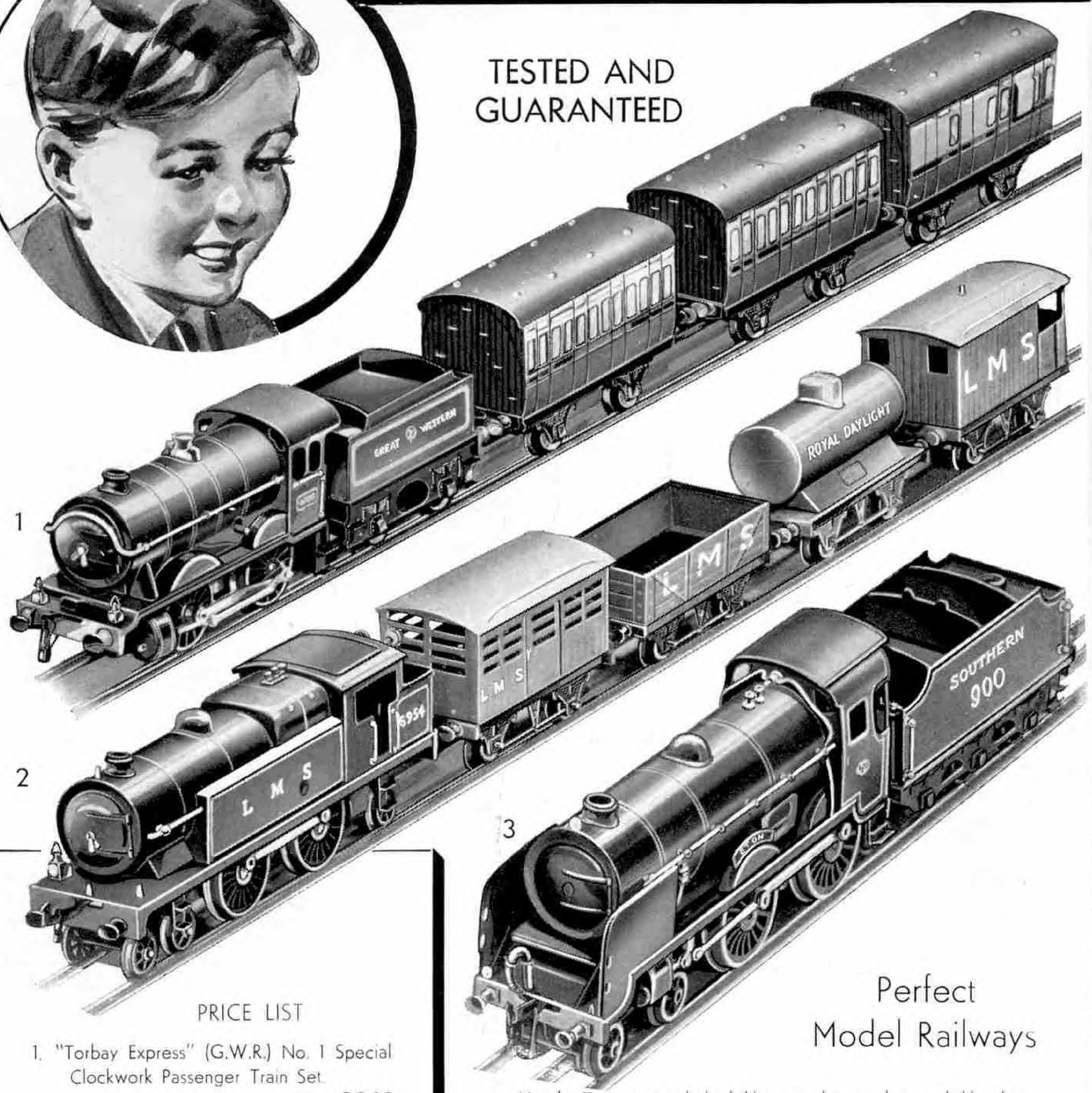
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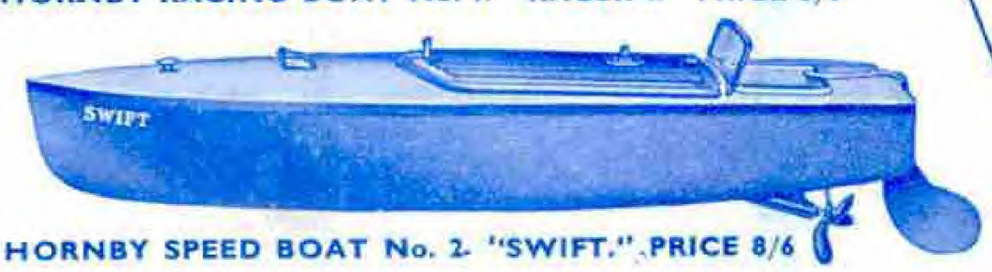
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